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DeafSpace™: Existing Buildings Adapted to Provide a More Optimal and Sustainable Environment

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DeafSpace™:
Existing Buildings Adapted to Provide a More Optimal and Sustainable Environment

A Thesis Presented

By

CHRISTOPHER WILLIAM BRUCKER

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Thesis Validator
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Without you, this thesis wouldn't be possible. Thank you.

ABSTRACT

DEAFSPACE™:

EXISTING BUILDINGS ADAPTED TO PROVIDE A MORE OPTIMAL AND SUSTAINABLE ENVIRONMENT

DECEMBER 2020

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Architectural design often creates spaces that are accessible to many, but not all people. In particular, many buildings are designed for hearing people; those who design with accessibility in mind typically consider the needs of blind people and wheelchair users, but often neglect the needs of Deaf people. Thus, most built environments are hearing-centric and unconducive for Deaf people. Furthermore, the relationship between architecture and accessibility for people with disabilities did not become a priority in the United States until 1990 when the Americans with Disabilities Act (ADA) was introduced. The ADA requires architects to think differently and design barrier-free buildings for people with disabilities.

However, the ADA requires only the minimum in terms of accessible architectural design for Deaf people, such as the removal of structural barriers to communication in existing facilities (by adding, for example, a flashing alarm light); hence, some barriers are overlooked. Hansel Bauman, who coined the term

“DeafSpace,” has created an architectural framework to address this issue. Bauman is the Director of Campus Planning and Design at Gallaudet University in Washington D.C., and produced guidelines on how to design accessible building spaces for Deaf people.

Further, the World Deaf Architecture (WDA) organization, founded by a group of Deaf architects, has a network of Deaf architects who share information on certain designs and guidelines, such as DeafSpace. Some of the WDA members offer DeafSpace consultations to architecture firms on how to provide the best designs for Deaf people’s optimal use.

This thesis used an existing building, Lyndon Baines Johnson Hall (LBJ) on the campus of the Rochester Institute of Technology (RIT). LBJ was designed by a team of architects who did their research and provided the best they could; however, they did not apply the principles of DeafSpace, since this concept did not exist at the time. The National Technical Institute for the Deaf (NTID) administration currently has its offices in the LBJ building, and has asked a couple of architects to develop designs and ideas for expansion and renovation utilizing DeafSpace guidelines, and obtaining consultations from WDA members. The primary goal of this design thesis is to apply the principles of DeafSpace to the LBJ Building to create an optimal environment for the students and teachers at NTID, and to improve their functional and sensory experiences within the building.

JURY PANEL

Hansel Bauman, AIA

An architect for Gallaudet University who coined the term “DeafSpace.” The executive director of Campus Design and Construction at Gallaudet University, he developed the guidelines for DeafSpace, and designed some of the buildings on the Gallaudet campus.

Philip Rubin, Associate AIA

A Deaf architect in California who has experience working with Bauman to develop DeafSpace guidelines. He also worked on the designs of a few buildings at RIT using DeafSpace guidelines.

James Yarrington, AIA

A licensed architect and Director of Campus Design and Planning at RIT, Yarrington is essential to case studies for other buildings that have been remodeled on campus. He provides consultations on guidelines to satisfy RIT-established standards for buildings.

Robert Nichols, Associate AIA

An architect and an Associate AIA member, Nichols is the director of the World Deaf Architecture organization, an organization with goals that involve developing networking opportunities between Deaf architects and the sharing of information and data on certain designs such as DeafSpace.

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Chapter 1

Introduction

1.1 DeafSpace: What is it?

In 1990, the Americans with Disabilities Act (ADA) was signed into law by President George H.W. Bush. This act was a force towards raising awareness for designers, engineers, instructors, and many others to suit the needs of people with disabilities, including deaf and hard of hearing people. This law requires that designers incorporate accommodations within their designs to provide equal access to services and facilities.[1]

DeafSpace, coined by Hansel Bauman, is a type of design that goes beyond the ADA regulations. Bauman developed guidelines for architects to follow so that their

[1] Americans with Disabilities Act. "Title III Regulations." *Part 36 Nondiscrimination on the Basis of Disability in Public Accommodations and Commercial Facilities.* https://www.ada.gov/regs2010/titleIII_2010/titleIII_2010_regulations.htm.

designs could better serve the deaf and hard of hearing community. DeafSpace has five principles: Space and Proximity, Sensory Reach, Mobility, Light and Color, and Acoustics.[2]

- The goal of these principles is to improve the quality of life among the Deaf community. DeafSpace creates a type of space to provide the Deaf community a sense of belonging. For example, open space, extra mirrors, adjustable window blinds, and a gathering space contribute to a visually accessible environment that fosters the signing Deaf community.[3]
- In addition, according to Resolution A/RES/61/106 adopted the United Nations General Assembly, designers need to make sure to enable people with disabilities can live independently and participate fully in all functions of life.[4]
- Under Article 4(f) of this resolution, designers and countries participating in this resolution should undertake and encourage research for universal design, which would require minimum possible changes with a limited budget. They are also expected to promote their availability, and such requirements are within DeafSpace guidelines.[5]

[2] Gallaudet University, *DeafSpace*, https://www.gallaudet.edu/campus-design-and-planning/deafspace.

[3] Hansel Bauman, "DeafSpace: A Rich Sensory World", *Access by Design*, no. 139 (Summer 2014): 19.

[4] General Assembly, "Resolution adopted by the General Assembly on 13 December 2006", *Convention on the Rights of Persons with Disabilities,* New York City: United Nations. (2007): 8.

[5] General Assembly. *Convention on the Rights of Persons with Disabilities.* 6.

SPACE AND PROXIMITY

Space is one key aspect of DeafSpace. Since Deaf and hard of hearing people use their arms and hands to communicate, they tend to keep a certain physical distance from each other to provide for ample space. Therefore, hallways in DeafSpace design should be wider to allow other people walking by to pass the conversation zone. Designers should be aware that as the number of people talking increases, the size of the conversation zone likely will grow as well,[6] as seen in Figure 1.1.

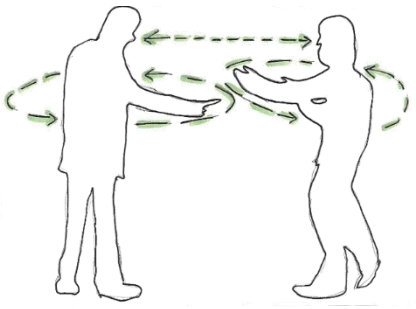

Figure 1.1 – Space and Proximity[7]

SENSORY REACH

Sensory Reach is when a Deaf person "reads" their surroundings, as shown in Figure 1.2. This may be compared to the way hearing people use their ears to be aware of their surroundings. To promote a Deaf person's sensory reach, the space should not have too many distractions, strong colors, or moving objects, which could inhibit the Deaf person's awareness of their surroundings.[8]

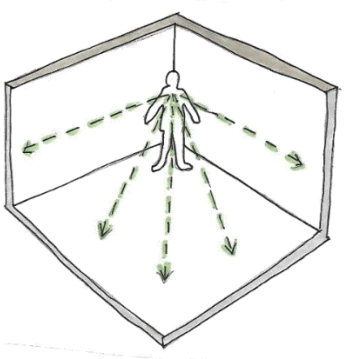

Figure 1.2 – Sensory Reach[9]

[6] Gallaudet University, *DeafSpace*, https://www.gallaudet.edu/campus-design-and-planning/deafspace.

[7] Dangermond Keane, *Dangermond Keane Architecture*, http://dangermondkeane.com/.

[8] Gallaudet University, *DeafSpace*

[9] Keane, *Dangermond Keane Architecture*.

MOBILITY

Mobility affects how people move around in rooms, hallways, gathering spaces, dining areas, and so on. In most circumstances, hearing people can recognize another person walking from the other side of a corner in such hallways. Hearing people are aware of their surroundings by recognizing echoes, voices, and/or footsteps, and can detect where these sounds come from. Deaf people, on the other hand, usually depend on their eyesight and have to look around them to be aware of their surroundings. Due to barriers to sightlines of tight corners, sometimes a Deaf person accidentally runs into another person at a hallway corner. Tight corners should be rounded or cut in a manner that Deaf people can see others approaching them,[10] as seen in Figure 1.3.

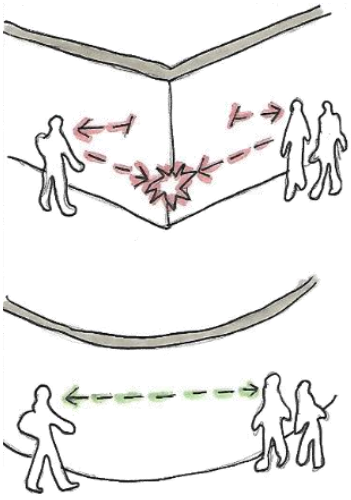

Figure 1.3 – Mobility[11]

LIGHT AND COLOR

Light and Color are important aspects of DeafSpace because the Deaf community depends heavily on visuals. Any type of bright color or glare could impair their vision. A neutral color is important for backgrounds, as seen in Figure 1.4. Additionally, signers and lip-readers in the Deaf community have been known to

[10] Gallaudet University, *DeafSpace*, https://www.gallaudet.edu/campus-design-and-planning/deafspace.

[11] Dangermond Keane, *Dangermond Keane Architecture*, http://dangermondkeane.com/.

tire easily due to heavy usage of their eyes, so any kind of glare isn't helpful for this. Lighting is also important so Deaf people can see better, and assist with socialization and incidental learning, both crucial to Deaf students' educational experiences.[12] The lights should be soft and diffused instead of direct.[13]

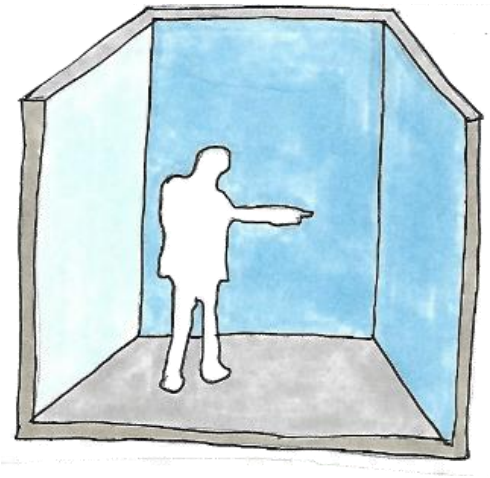

Figure 1.4 – Light and Color[14]

ACOUSTICS

Discussing acoustics and the Deaf community may seem counterintuitive, but many people in the Deaf community have different hearing levels. For example, for those who wear hearing aids, background sounds are often an impediment to their hearing abilities. Deaf people who are unable to distinguish sounds from their surroundings, yet feel various sound vibrations, likely become distracted by trying to detect the source of the sound or vibration. For instance, if there is a highway nearby, as seen in Figures 1.5 and 1.6, a hearing person could identify and then filter out the noise, while a Deaf person would wonder what was causing the

[12] National Summit for Educational Equity, *The Importance of Incidental Learning,* https://nsee.info/2017-ele-6/, April 2017.

[13] Gallaudet University, *DeafSpace*, https://www.gallaudet.edu/campus-design-and-planning/deafspace.

[14] Dangermond Keane, *Dangermond Keane Architecture*, http://dangermondkeane.com/.

vibrations. The space should be designed to reduce reverberation and other background noise,[15] which also benefits hearing people.

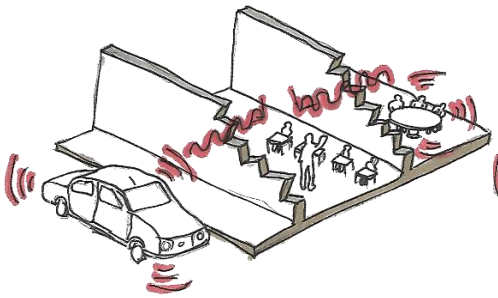

Figure 1.5 - Acoustics Diagram A[16]

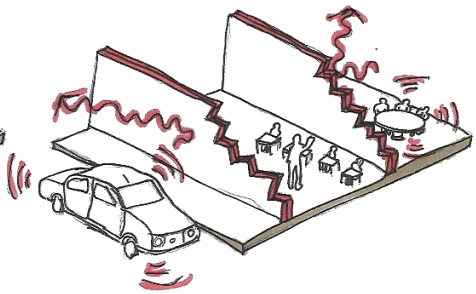

Figure 1.6 - Acoustics Diagram B[17]

Although Bauman's DeafSpace guidelines are crucial for creating accessible spaces, his design principles focus on providing guidance for the creation of new buildings, which takes the spotlight away from existing buildings. One example of an existing building is located at RIT on the east end of the campus. Lyndon B. Johnson Hall was built in 1974, long before the ADA was signed. The building primarily houses classrooms, labs, offices, and two theaters. Since the building is an existing building, this thesis applied DeafSpace principles toward an outdated building.

[15] Gallaudet University, *DeafSpace*, https://www.gallaudet.edu/campus-design-and-planning/deafspace.

[16] Dangermond Keane, *Dangermond Keane Architecture*, http://dangermondkeane.com/.

[17] Keane, *Dangermond Keane Architecture*.

Chapter 2

Methods and Procedures

This thesis used an existing building, Lyndon Baines Johnson Hall (LBJ) on the campus of Rochester Institute of Technology (RIT) as a case study. The primary goal of this design thesis was to apply the principles of DeafSpace to LBJ Hall to create an optimal environment for the students and teachers at the National Technical Institute for the Deaf (NTID), and improve their functional and sensory experiences within the building. The building was measured as existing using DeafSpace metrics and then was once again measured after applying recommended design interventions.

2.1 Methods

The first steps to developing a design for the existing building involved researching the basics such as the DeafSpace principles. In the previous section, DeafSpace

was explained in terms of the benefits it could offer and its principles. In the next chapter, case studies are reviewed. Since DeafSpace is a relatively new concept, the examples from those case studies may better illuminate the concept once its DeafSpace principles are applied.

The case studies are located both at Gallaudet University in Washington, D.C. and at RIT in Rochester, New York. During the fall of 2018, buildings at the Gallaudet campus were photographed, studied, analyzed, and sketched. An interview was also conducted with Hansel Bauman, who works as an architect and the co-director the DeafSpace Institute. Another interview was with World Deaf Architecture President Robert Nichols, who lives in Washington D.C. The main goals for these interviews and case studies were to gain knowledge and develop metrics on DeafSpace to support future designs that apply DeafSpace principles to existing buildings instead of focusing on new buildings.

The research and data collection were continued at RIT, which has two buildings that were used for case studies. One is a renovated building that created a more open floor plan, an excellent example of DeafSpace application to an existing building. This building, Lydon Baines Johnson Hall (LBJ), houses NTID. Throughout the years, LBJ underwent many renovations that focused mainly on the interiors and room layout. In spite of all these renovations, the amount of natural sunlight remained unchanged. The main hallway in the center of the building was used as a social space for Deaf students to meet and socialize, but

due to a newer building adjacent to LBJ, Student Development Center (SDC), the social area shifted from LBJ to SDC.

In meeting the primary goal of improving functional and sensory experiences in LBJ, there were several objectives to address:

- Improve the building's circulation.
- Satisfy more DeafSpace guidelines.
- Bring in more natural light.

The project was to develop a new social zone for Deaf students and instructors, as they appreciated views of nature in the atrium. The proposed renovations would not only make LBJ more accessible to Deaf students and encourage incidental learning, but also would allow the building to be more sustainable. In other words, DeafSpace can be viewed as sustainable universal design, although this is not the main intention of DeafSpace. This project was used to measure the success of the designs using a DeafSpace matrix, based on and inspired by a project matrix for Rocky Mountain Deaf School in Colorado.

2.2 Procedures

The strategy for collecting data involved gathering accurate and detailed information from articles on DeafSpace, taking pictures for case studies, and collecting building metrics using DeafSpace matrix; the data and images were used to show how DeafSpace designs can be successful, and also presented as

examples of DeafSpace. The blueprints of existing buildings were used as basic comparisons and to show how the DeafSpace proposed design could have an impact. Along with DeafSpace's guidelines, the DeafSpace thesis criteria were applied in a table matrix format with planning principles used for Rocky Mountain Deaf School's BEST Grant Submittal (published in 2011). The table was created to show a summary based on these metrics also found on Rocky Mountain Deaf School's BEST Grant Submittal Project.[18]

[18] Bauman, Anderson, Mason, and Dale, *Rocky Mountain Deaf School BEST Grant Submittal,* Submittal, Golden, Colorado: Hansel Bauman - Architect + Planner and Anderson Mason Dale Architects, 2011.

DeafSpace Guidelines	Specifications	Case Study Metrics
Space and Proximity	**Personal Space** Low Number = 1 2 3 4 5 = High Number	
	Furniture Layout – "U-Shaped" Furniture Not Satisfied = 1 2 3 4 5 = Very Satisfied	
	Visual Sightlines Isolated = 1 2 3 4 5 = Openness and Transparent	
Sensory Reach	**Open vs. Privacy** Mixed and Fluid = 1 2 3 4 5 = Clear Space for Both	
	Vibration Range High Vibration = 1 2 3 4 5 = Low or No Vibration	
	Visual Range Short Range = 1 2 3 4 5 = Long Visual Range	
Mobility	**Corridor Width** Narrow = 1 2 3 4 5 = Wide	
	Glass Corner None = 1 2 3 4 5 = Good Use	
	Curved Corner / Soft Intersection None = 1 2 3 4 5 = Good Use	
	Visual Cues / Floor Material / Wayfinding No Cues = 1 2 3 4 5 = Good Number of Visual Cues	
	Walkability Bad Design = 1 2 3 4 5 = Good Design and Various Materials	
Light and Color	**No Glare from Windows / Background** Too Much Glare = 1 2 3 4 5 = No Glare	
	Bright and Loud Colors Not Allowed Too Bright and Loud Colors = 1 2 3 4 5 = Neutral Colors	
	Diffuse and Soft Lighting Too Direct Lighting = 1 2 3 4 5 = Soft Lighting	
	Soft Reflection Direct Reflection = 1 2 3 4 5 = Soft Reflection	
Acoustics	**Noise Level from Outside** Noisy = 1 2 3 4 5 = Quiet, No Noise	
	Vibration from Outside Vibration = 1 2 3 4 5 = No Vibration	
	TOTAL:	

Table 2.1 – Template Table for Case Study Data Metrics

A complete list of the criteria can be found Table 2.1. It was used to record the key metrics and to see if the building was ideal for a case study to support the design of LBJ building renovations. The list of criteria consisted of all the guidelines for DeafSpace, specifications, and metrics for six case studies, with the fifth and sixth case studies being the LBJ building before and after renovations. However, to make the tables more readable, they were split into six different tables, one for each case study. The case study tables were shared with up to ten users who frequented the buildings; these users scored the buildings with described values between 1 to 5 for each specification within the table. The values were defined in depth within the table under the “Specification” column. The average of those scores were then recorded into column charts.

Due to the lack of data from other DeafSpace projects, the acoustics guideline, the last guideline mentioned in Table 2.1, was modified to be better suited to Deaf and hard of hearing people who evaluated the specifications. The guideline was reduced to two specifications, noise level and vibration level.

Once the total score was collected from each of the first four case studies from each user, it was then known which case study was most Deaf friendly, and the thesis design focused on high numbers in all case studies to create a design that would incorporate the best out of each case study into one project. The goal for the final design metric was to reach 85, the highest possible total.

Chapter 3

Case Studies and Precedents

3.1 Lowenthal Hall Building at Rochester Institute of Technology

The first case study was Lowenthal Hall Building, which houses RIT's College of Business. The building was built around 1976, and underwent a renovation in 2007 with a new atrium and expanded study areas. This building was chosen as a case study because it shared similar goals with the LBJ Hall remodel project.

- When Lowenthal Hall was completed, it contained eighteen classrooms with two further divided into two classrooms via wall dividers.
- Each of those classrooms had a narrow window to allow very little natural light.
- The offices were mainly located on split levels between the first and second floors, with some more halfway below the ground level.

- The building also had an open space lobby at the center of the building with skylights. The access went through the front entrance (on the east side) straight into the lobby.
- The lobby was open through all floors. All levels were visible from within the lobby, an important DeafSpace feature.
- The second floor contained an overhang above the ground level, preventing Deaf and hard of hearing students from seeing each other or communicating in these areas (see Figure 3.1).

Figure 3.1 – The Main Lobby at Lowenthal Hall Building – © Christopher Brucker, 2020

- The building had natural lighting from the ceiling, which helped with lighting up the lobby space. However, the ground level area was much darker due to the second-floor overhang as shown in Figure 3.1.
- Lowenthal Hall building's wall, columns, and beams were made of steel beam covered with concrete, which greatly reduced the vibration range. The floor was mostly made of bricks, which also reduced the vibration range.

- On the ground level, there were defined spaces where students could work together or work with their instructors. The furniture seemed to satisfy DeafSpace guidelines since they were square tables with four chairs, similar to a round table with four chairs.

Figure 3.2 – Original First Floor Plan for Lowenthal Hall [19]

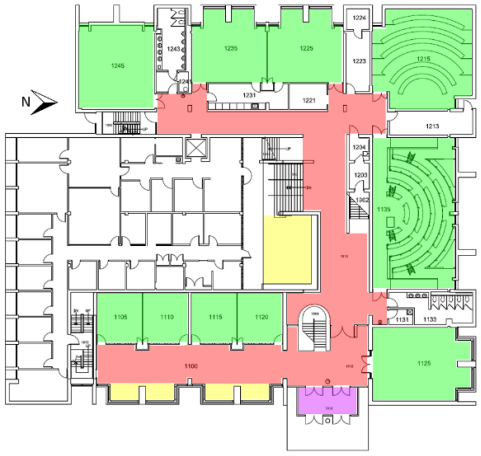

Figure 3.3 – Renovated First Floor Plan for Lowenthal Hall [20]

- The offices were located on ground and split levels as shown in Figure 3.2, highlighted in blue.
- The classrooms (highlighted in green in Figure 3.2) were farther outside of the building with corridors inside, causing a lack of natural light into these corridors that were already dark (highlighted in red).
- In 2007, the building underwent a major renovation, which switched the classrooms and the corridors on the east side of the building, with an addition of the atrium and a new study space within the atrium.

[19] Facilites Management Services, Rochester Insitute of Technology, 1975.

[20] Ibid., 2006.

- The renovations also turned the negative space outside the building into indoor space to gain more square footage. The addition and the renovations satisfied even more DeafSpace guidelines, although it did not greatly help with visual sightlines or mobility.
- A new atrium was added to fill up negative space provided by the original building design. One can compare Figure 3.4 (before) and 3.5 (after).

Figure 3.4 - Front Entrance of Lowenthal Hall Building, Before the Renovation – © RIT Archives, used with permission

Figure 3.5 – Front Entrance of Lowenthal Hall Building, After the Renovation – © Christopher Brucker, 2020

- The new atrium was located at the east side of the building, which contained a new entrance space and a new study area above the second floor.
- The classrooms were moved inward, which meant there were no longer any windows. This could be considered beneficial for Deaf and hard of hearing students, with elimination of sunlight glare and exterior noise.

- The new study spaces were created on the first floor at the east side of the building, just south of the entrance. The new space had much larger windows, and curtained walls to allow much more natural light to shine into the space.
- The classrooms (highlighted green in Figure 3.3) switched places with the corridor (highlighted red) and became much wider, and created new study space (highlighted yellow) using negative space outside of the building and interior via new curtained walls. The new atrium entrance is highlighted purple.

Figure 3.6 – Negative Space Outside of Lowenthal Hall Building

Figure 3.7 – New Curtain Wall Outside of Lowenthal Hall Building

- To gain a better understanding of the negative space outside of the building, the negative space (highlighted in Figure 3.6) was between the narrow windows and the structural column, and under the second-floor overhang. This space still existed on the other side of the building, which housed a larger classroom.
- In this widened corridor, the study areas were located aside, into the “alcove” created by negative space that is no longer there as shown in Figures 3.6 and 3.7.

Figure 3.8 – Renovated East Corridor with New Study Areas and Seating

Figure 3.9 – Expanded Business Lab

- In the new study spaces inside the east side of the building (Figure 3.8), there was carpet that delineated a separate space at the building entrance. This is a good use of visual cue under the Mobility guideline, and shows that the carpeted area is for studying, giving people the feeling that they need to walk much slower. This concept is similar to hard floor-to-soft floor transitions between corridors and stores inside malls.
- There were seating areas where students and staff can sit down to talk, read, and/or study. This may not comply with DeafSpace since students who are Deaf and hard of hearing need to look at each other's faces to communicate and may trip over the furniture if not paying attention.

- Inside the northeast corner area of the building, the business lab (formerly a classroom) gained more square footage by taking the negative space outside into the classroom and replacing solid brick walls with curtained walls. This expanded space can be seen in Figure 3.9, although this photograph shows that the natural light may be too bright, which does not satisfy the “No Glare” aspect of the Light and Color guideline.

Figure 3.10 – Elevated / Stadium Seating in Renovated Classroom [21]

- Inside pm the north side of the building, two existing classrooms were merged and renovated into lecture rooms with elevated semi-circled platforms, about a rise of six inches per ascending row.
- The elevated platforms enabled students to see the lecturer from behind other students who sat at lower platforms.
- The semi-circle seating setting provided each student an unobstructed view of other students and the teacher, as shown in Figure 3.10. One disadvantage of this arrangement is that the students in front cannot see the students sitting behind them, which could discourage classroom discussions.

[21] Rochester Institute of Technology, *Saunders College of Business - Future Business Leaders & Entrepreneurs Program,* Rochester, New York, August 20, 2013.

- One thing Lowenthal Hall strongly lacked was curved corners. According to the renovated floor plans, there was no evidence of curved corners, although it appeared possible that curved corners could be added in some areas.
- Outside Lowenthal Hall, there was an enlarged quad (Figure 3.11), which was round with fewer trees, giving students more open-view sights and improved walkability. The old and much smaller quad was more rectangular, with no benches in sight. Students need a space to gather as a community, especially those who are Deaf or hard of hearing for idea exchange and socialization.

Figure 3.11 – Expanded Quad Photo - © Christopher Brucker, 2020.

DeafSpace Guidelines	Specifications	Case Study Metrics
Space and Proximity	**Personal Space** Low Number = 1 2 3 4 5 = High Number	4
	Furniture Layout – "U-Shaped" Furniture Not Satisfied = 1 2 3 4 5 = Very Satisfied	4
	Visual Sightlines Isolated = 1 2 3 4 5 = Openness and Transparent	4
Sensor Reach	**Open vs. Privacy** Mixed and Fluid = 1 2 3 4 5 = Clear Space for Both	3
	Vibration Range High Vibration = 1 2 3 4 5 = Low or No Vibration	3
	Visual Range Short Range = 1 2 3 4 5 = Long Visual Range	4
Mobility	**Corridor Width** Narrow = 1 2 3 4 5 = Wide	5
	Glass Corner None = 1 2 3 4 5 = Good Use	1
	Curved Corner / Soft Intersection None = 1 2 3 4 5 = Good Use	1
	Visual Cues / Floor Material / Wayfinding No Cues = 1 2 3 4 5 = Good Number of Visual Cues	4
	Walkability Bad Design = 1 2 3 4 5 = Good Design and Various Materials	4
Light and Color	**No Glare from Windows / Background** Too Much Glare = 1 2 3 4 5 = No Glare	3
	Bright and Loud Colors Not Allowed Too Bright and Loud Colors = 1 2 3 4 5 = Neutral Colors	5
	Diffuse and Soft Lighting Too Direct Lighting = 1 2 3 4 5 = Soft Lighting	4
	Soft Reflection Direct Reflection = 1 2 3 4 5 = Soft Reflection	4
Acoustics	**Noise Level from Outside** Noisy = 1 2 3 4 5 = Quiet, No Noise	3
	Vibration from Outside Vibration = 1 2 3 4 5 = No Vibration	5
	TOTAL:	**61**

Table 3.1 – Case Study Data Metrics on Lowenthal Hall Building

3.2 Sorenson Language and Communication Center at Gallaudet University

The second case study was a new building at Gallaudet University in Washington D.C., the James Lee Sorenson Language and Communication Center (SLCC). SLCC was named after the founder of Sorenson Media, a company that provides videophones and relay services. This facility was designed with DeafSpace principles in mind.

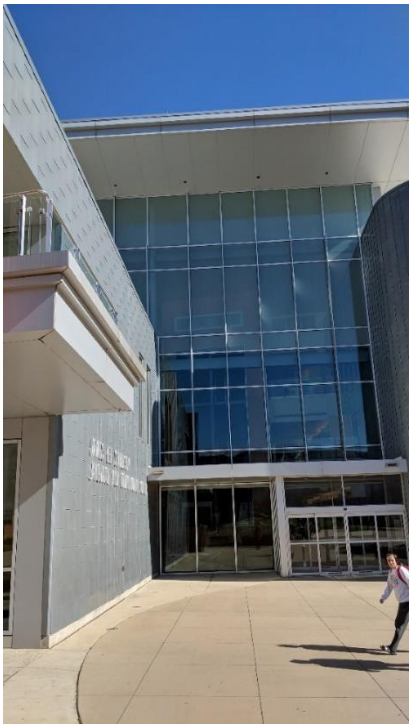

Figure 3.12 – Entrance of Sorenson Language and Communication Center

- At the building entrance, there were double automatic glass sliding doors, which allowed students and staff to access the entrance without diverting their eyes from chatting with each other. The doors can be seen in Figure 3.12.
- The large lobby inside the center of the building served as a community get-together area. Because the lobby had many DeafSpace aspects, the case study focused on the lobby rather than the classrooms since this type of lobby was ideal for the design proposal for the LBJ Hall's atrium expansion.

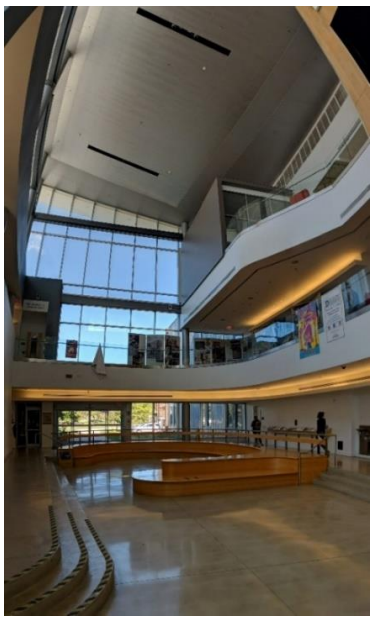

Figure 3.13 – Entrance Lobby, looking north

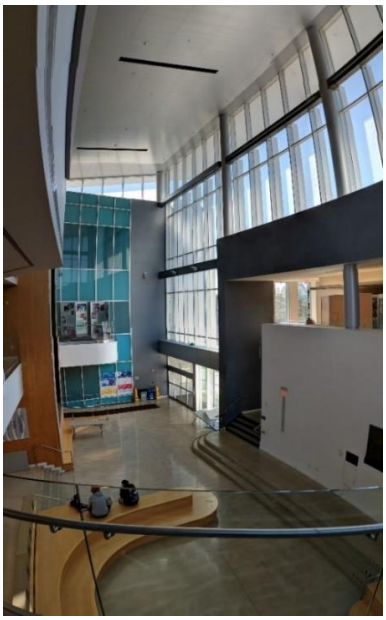

Figure 3.14 – Entrance Lobby, looking southwest

- The Center's large lobby (Figure 3.13) also had several different functions such as an open classroom, stage, social get-together, meeting, and more. Since the lobby was right by the front entrance, the lobby was easily located.
- Upon the lobby entrance (on the west side of the building), the first noticeable aspect is the large curtained wall on three different sides: north, west, and south. This configuration brought in the natural sunlight, especially during the afternoon.
- The curtained wall was from floor to ceiling, bringing a great amount of natural light without direct sunlight, since the sun travels across the south side.
- Only a small part of the curtained wall on the south side allowed some natural light while the roof above prevented direct sunlight. This also applied to the west wall, shown in Figure 3.14, but with a floor-to-ceiling curtain wall and a roof overhang at top of the front entrance.

Figure 3.15 – Looking Down to Lobby from Second Floor (at 3:30 p.m. in October 2020)

- The transparent railing on the second floor allowed people to see each other between the ground floor and the second floor. The third floor also had a transparent railing as seen in Figure 3.15.
- At the southeast corner of the lobby, facing the entrance, was a semi-transparent elevator with glass on one side to allow users to see down to the lobby. The west external wall of the elevator shaft was open with structural beams and columns (Figure 3.16). As soon as the elevator's door opened in the third floor, people were greeted by a six-feet high window that looked out into the lobby (Figure 3.17 and Figure 3.18).

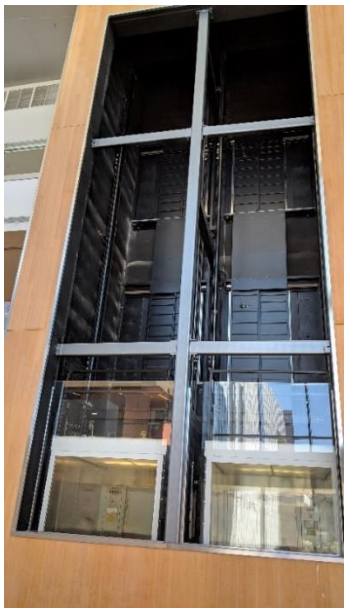

Figure 3.16 – External Wall of Elevator Shaft

Figure 3.17 – Approaching the Elevator

Figure 3.18 – Inside the Elevator

- The main reasons for a glass elevator were to:

  1) allow students and staff to see if someone is inside the elevator

  2) provide opportunities to communicate through the glass

  3) allow people to know which floor the elevator is at.

  4) provide information about activities outside the elevator, especially during an emergency.

- During an emergency, the elevator can stop with a phone being the only method of communication from within the elevator. However, with the glass on one side, the passengers from inside the elevator can get people's attention and communicate via sign language in an emergency.
- Another reason of having a glass elevator is to allow natural light to shine through.

Figure 3.19 – Circular Bench in Lobby

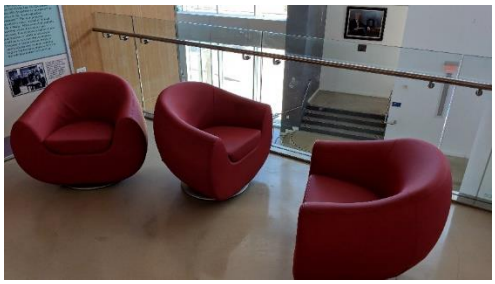

Figure 3.20 – Swivel Chairs on Second Floor

- A large single three-quarter-circle fixed wooden bench in the north side area, encouraged students to get together and sit face-to-face to communicate.
- This area also could be considered “a classroom outside of a classroom.” The large furniture also had a higher platform that could be used as a bench, so students could form two stepped horizontal rows, as shown in Figure 3.19.
- The drawback of this design is that students who sit in front would have to turn back to see their peers behind them.
- On the second floor, overlooking the lobby, chairs could swivel, allowing people to turn to wherever they need to see and communicate as seen in Figure 3.20.
- The swivel chairs were next to the transparent railing, so the seated users could see who comes into the building via the front door. For example, a team of students waiting for their teammate could get the teammate’s attention upon entrance, notifying the teammate to come upstairs. Conversation also could be carried on between people while are sitting down.

DeafSpace Guidelines	Specifications	Case Study Metrics
Space and Proximity	**Personal Space** Low Number = 1 2 3 4 5 = High Number	4
	Furniture Layout – "U-Shaped" Furniture Not Satisfied = 1 2 3 4 5 = Very Satisfied	4
	Visual Sightlines Isolated = 1 2 3 4 5 = Openness and Transparent	5
Sensor Reach	**Open vs. Privacy** Mixed and Fluid = 1 2 3 4 5 = Clear Space for Both	3
	Vibration Range High Vibration = 1 2 3 4 5 = Low or No Vibration	3
	Visual Range Short Range = 1 2 3 4 5 = Long Visual Range	5
Mobility	**Corridor Width** Narrow = 1 2 3 4 5 = Wide	5
	Glass Corner None = 1 2 3 4 5 = Good Use	4
	Curved Corner / Soft Intersection None = 1 2 3 4 5 = Good Use	4
	Visual Cues / Floor Material / Wayfinding No Cues = 1 2 3 4 5 = Good Number of Visual Cues	4
	Walkability Bad Design = 1 2 3 4 5 = Good Design and Various Materials	4
Light and Color	**No Glare from Windows / Background** Too Much Glare = 1 2 3 4 5 = No Glare	4
	Bright and Loud Colors Not Allowed Too Bright and Loud Colors = 1 2 3 4 5 = Neutral Colors	4
	Diffuse and Soft Lighting Too Direct Lighting = 1 2 3 4 5 = Soft Lighting	4
	Soft Reflection Direct Reflection = 1 2 3 4 5 = Soft Reflection	4
Acoustics	**Noise Level from Outside** Noisy = 1 2 3 4 5 = Quiet, No Noise	5
	Vibration from Outside Vibration = 1 2 3 4 5 = No Vibration	5
	TOTAL:	**71**

Table 3.2 – Case Study Data Metrics on Sorenson Center

3.3 Hall Memorial Building at Gallaudet University

The third case study was once again located at Gallaudet University, the Hall Memorial Building. It was built in 1959, with two major expansions between 1964 and 2002 and a major interior renovation in 2016. When it was first built, it was in a T-shaped building layout, with the first expansion adding a wing to the northeast corner of the building. The second expansion saw the addition of a fourth floor.

Figure 3.21 – Original Southwest Façade (1959)

Figure 3.22 – Current Southwest Exterior of the Building (Front entrance)

Figures 3.21 and 3.22 demonstrate the original design and current design. However, DeafSpace guidelines were not applied to the building until the 2016 renovation.

- During the 2016 renovations, several DeafSpace features were applied:
    1) Many walls were taken down.
    2) Hallways were widened.
    3) Transparent and curved walls were used.
    4) Open community space was incorporated.

Figure 3.23 – Building Lobby – © Christopher Brucker, 2018.

- A large lobby (Figure 3.23) at the center of the building was added during the second expansion since the building lacked a community space.
- The hub for the lobby beyond the southeast entrance of the building was a large square space where the students and faculty could socialize as a community.
- The lobby contained four large columns that interfered with visual sightlines. The lobby space used to have exterior negative space prior to the second expansion.
- The lobby had skylights, which helped brighten up the space without the use of artificial lights.
- This space was surrounded by the T-shaped building when the first expansion wing was added, creating a lower-case h-shaped building.

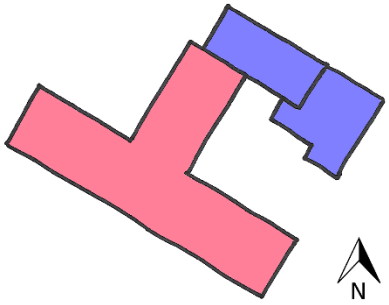

Figure 3.24 – Building Shape from Above, prior to Second Expansion

- In Figure 3.24, the red section is the original building and the blue section is the first expansion. The negative space between both sections clearly shown was where the second expansion took place with the lobby addition.
- Outside the building, there was different textures and colors on the walkway. Since Deaf and hard of hearing people use their eyes and hands to communicate, they are not always paying attention and could trip over grass or items without any warning. Different textures (Figure 3.25) within the pavers help people navigate, and encourages awareness of the border, similar to bumpy borders on the highway to warn drivers they are drifting out of their lanes. This aspect can also benefit DeafBlind and blind people.

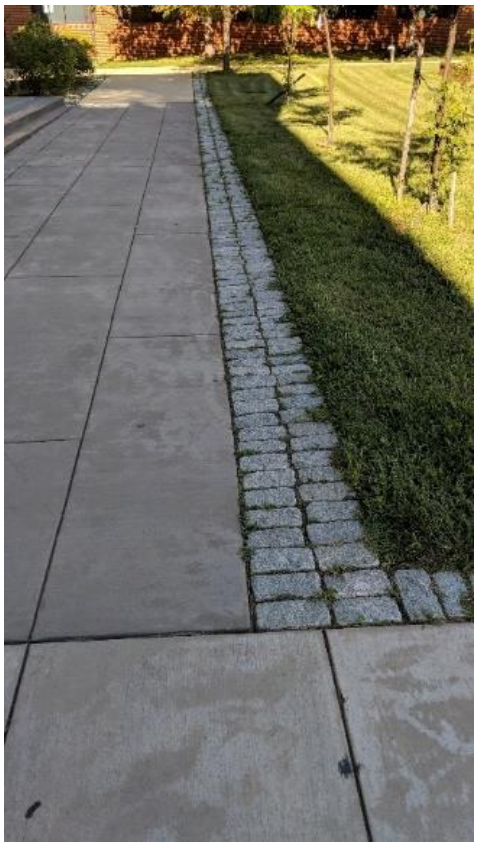

Figure 3.25 – Walkway with Different Textures

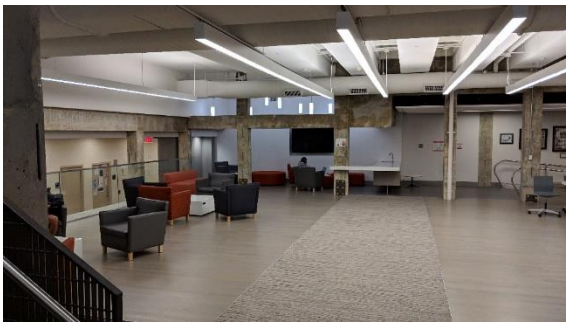

Figure 3.26 – Community Space on 3rd Floor

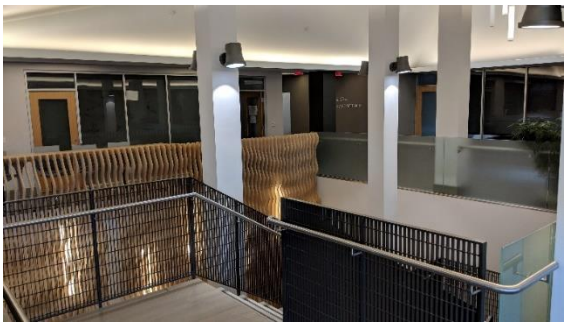

Figure 3. 27 – Top of the Staircase

- A community space (Figure 3.26) on the third floor, part of the 2016 renovations, was located by the staircase, which had a see-through railing. See-through railings, as seen in Figure 3.27 allow people to see other people coming up and down the stairs.
- The community space's use became specifically for students to study or meet.
- For more privacy, students could use alcove spaces behind the columns, open enough for students to see their surroundings. The railings around the area were transparent so that seated people could see if anyone was walking by, much like people who can hear would hear them walking by (see left side of Figure 3.26).
- The fourth floor was added during the second expansion as shown in Figure 3.28.

Figure 3.28 – Fourth Floor Addition Under Construction

- While the newest section of the building was added before the 2016 renovation, the building still lacked a lot of DeafSpace features. The renovation heavily involved a redesign of existing space to incorporate DeafSpace features.

Figure 3.29 – Renovated Space on 4th Floor [22]

- In Figure 3.29, the hub is located near the center of the building on the fourth floor. One could see the open hallways in both directions.
- The columns used to be inside the walls, the standard for most buildings back then. This made the hallways narrower. The renovation pushed the walls away from the columns, leaving the columns exposed.
- A transparent curved wall was used as a hallway corner so that people could see each other as they approached each other.
- The widened hallway also provided more space for furniture.
- The furniture was used to prevent people from running into the columns during conversation. The furniture also was utilized to create a clear right of way in the open hallway.

[22] Hoachlander Davis, *Interface Engineering,* https://interfaceengineering.com/work/gallaudet-university-hall-memorial-building-renovation.

- This space also had different flooring materials and colors. The hard tiled floor designated a walking area, and the carpeted area designated a quiet study area.
- The white border circle at the base of the columns also provided greater contrast, making columns more noticeable.

- On the other side, there were two types of spaces within the hallway: 1) A more open social seating area and, 2) a private study area.

Figure 3.30 – Widened Hallway with Leisure Seating Area [23]

- The hallway (Figure 3.30) showed a clear boundary between the seating area and the walkway by using different flooring materials.
- The seating area used to be all private offices, with walls where the columns were.
- The offices used to have all solid walls with exterior windows on one side, but the offices were too big for faculty and staff. Back then, architects and designers were focused on the instructors' needs instead of the students.
- With students in mind, the walls were pushed back towards the exterior walls, making the offices smaller yet sufficient for instructors.
- The extra space continues to be utilized by students for free time and/or meetings.

[23] Hoachlander Davis, *Interface Engineering,* https://interfaceengineering.com/work/gallaudet-university-hall-memorial-building-renovation.

- The offices were retrofitted with semi-transparent walls and doors to provide privacy, yet allow students to know when the teachers were there without having to open the doors to check.
- Another benefit of semi-transparent glass was to allow natural light from exterior windows to filter through the hallway.

Figure 3.31 – Widened Hallway with Study Area - © Christopher Brucker, 2018

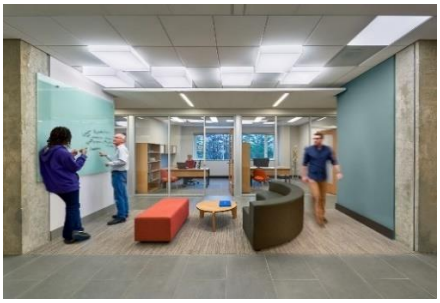

Figure 3.32 – Study Area with Office in Background [24]

- In another hallway, the setting was a bit different, but the original configuration was the same as the one in the previous hallway. In Figure 3.31, the office walls were pushed back towards the exterior walls to create a new study area with transparent whiteboards for students.
- More privacy was created by having floor-to-ceiling walls between each area, with gaps on both sides of the study area for people to walk through. Figure 3.32 shows a study area in use by instructors and the students.

[24] Hoachlander Davis, *Interface Engineering,* https://interfaceengineering.com/work/gallaudet-university-hall-memorial-building-renovation.

DeafSpace Guidelines	Specifications	Case Study Metrics
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	Furniture Layout – "U-Shaped" Furniture Not Satisfied = 1 2 3 4 5 = Very Satisfied	4
	Visual Sightlines Isolated = 1 2 3 4 5 = Openness and Transparent	4
Sensor Reach	**Open vs. Privacy** Mixed and Fluid = 1 2 3 4 5 = Clear Space for Both	5
	Vibration Range High Vibration = 1 2 3 4 5 = Low or No Vibration	3
	Visual Range Short Range = 1 2 3 4 5 = Long Visual Range	4
Mobility	**Corridor Width** Narrow = 1 2 3 4 5 = Wide	4
	Glass Corner None = 1 2 3 4 5 = Good Use	4
	Curved Corner / Soft Intersection None = 1 2 3 4 5 = Good Use	2
	Visual Cues / Floor Material / Wayfinding No Cues = 1 2 3 4 5 = Good Number of Visual Cues	4
	Walkability Bad Design = 1 2 3 4 5 = Good Design and Various Materials	4
Light and Color	**No Glare from Windows / Background** Too Much Glare = 1 2 3 4 5 = No Glare	4
	Bright and Loud Colors Not Allowed Too Bright and Loud Colors = 1 2 3 4 5 = Neutral Colors	5
	Diffuse and Soft Lighting Too Direct Lighting = 1 2 3 4 5 = Soft Lighting	4
	Soft Reflection Direct Reflection = 1 2 3 4 5 = Soft Reflection	3
Acoustics	**Noise Level from Outside** Noisy = 1 2 3 4 5 = Quiet, No Noise	5
	Vibration from Outside Vibration = 1 2 3 4 5 = No Vibration	5
	TOTAL:	**67**

Table 3.3 – Case Study Data Metrics on Hall Memorial Building

3.4 Rosica Hall at Rochester Institute of Technology

Figure 3.33 – Front Entrance to the Building

© Mark Benjamin (RIT/NTID)

The last case study was the Sebastian and Lenore Rosica Hall at RIT, built in 2013. It provides faculty, staff, and students a place for research at NTID. NTID is the national leader in research on the education of people who are Deaf and hard of hearing.[25] Philip Rubin was the DeafSpace design consultant for this project given his expertise and involvement with World Deaf Architecture.

Figure 3.34 – Philip Rubin (Seated Left) Working with Rosica Building Designers

© Mark Benjamin (RIT/NTID)

The building was located southwest of the LBJ, with an building between, the CSD Student Development Center (SDC). SDC houses the Student Life Team, student organizations, and a dining hall. Other than a bridge connecting to SDC, Rosica Hall is a free-standing building connected to other surrounding buildings.

[25] HBT Architects, *Rosica Hall, NTID @ RIT,* https://www.hbtarchitects.com/project/rosica-hall-ntid-rit/, 2020.

Figure 3.35 – Approaching the Entrance from Quad [26]

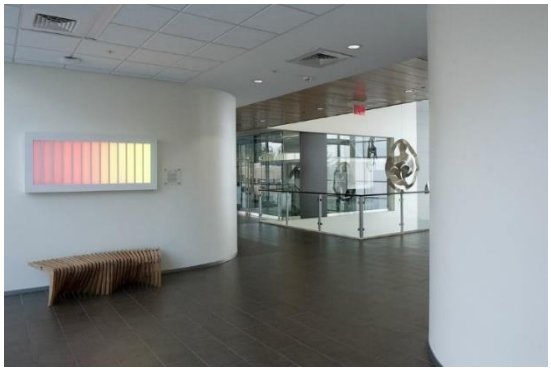

Figure 3.36 – Space Beyond the Bridge

© Mark Benjamin (RIT/NTID)

- The visual sightline outside front is shown when the Rosica Hall entrance was lined up with the walkway from and towards the existing quad at the center of other buildings (Figure 3.35), including SDC and LBJ.
- The building's entrance via the bridge had the heaviest traffic intersection among students and instructors. It was important for this space to be open and welcoming.
- The bridge was located at the north side of the building, and there was an external walkway underneath it, as seen in Figure 3.35.
- The building's entrance via the bridge was a large space with two curved corners as seen in Figure 3.36. These curved corners gave instructors and students the opportunity to see ahead without any visual impediment.
- Curved corners also provide a sense of where to go.

[26] HBT Architects, *Rosica Hall, NTID @ RIT,* https://www.hbtarchitects.com/project/rosica-hall-ntid-rit/, 2020.

Figure 3.37 – Staircase Area

- Further into the building, there was an open staircase with a high ceiling, equipped with a glass railing and a semi-exposed ceiling.
- Other than the transparent railing, there were two other key features in this space: extra wide stairs and a large semi-transparent curtained wall on the west side of the staircase.
- The wider stairs were needed since Deaf and hard of hearing people need more personal space between them as they walk and chat. Since the minimum of four feet for egress is not enough, six-feet wide stairs are considered sufficient space for four people (two pairs) to navigate while walking past each other in opposite directions.
- The large curtained wall had translucent glazing on the west side of the staircase, which provided indirect sunlight to reduce use of artificial lighting.
- The translucent glazing prevented the sun's harsh direct glare during the afternoon. Just to the right of the translucent glazing, there was a clear glazing facing north to maximize soft, indirect lighting from the north.
- The front information desk was visible from the first and second floors, helping students and instructors know where to go for questions and information.

Figure 3.38 – The Main Hallway on the Second Floor

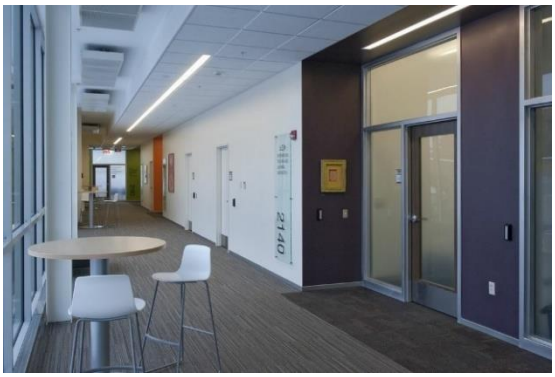

Figure 3.39 – Space Colors

- Within the building, there were two main hallways, one on the first floor and the other on the second floor. The first floor focused on strategic research labs, while the second floor focused on meeting rooms, discipline-based research centers, and innovation labs.[27]
- The research spaces had both transparent walls and solid walls, depending on the need for research privacy, as seen in Figure 3.38.
- The viewpoint of hallways from where the staircase is when one came out of the stairs, the hallway would be the first thing sighted on the right side.
- Each space within the floor was designated by visual colors as seen in Figure 3.39. This distinction helped students and instructors identify which space they were looking for rather than looking at all white walls and having to hunt for the room number and name.
- The hallway was also much wider to provide users more personal space to walk through as they converse in sign language.

[27] HBT Architects, *Rosica Hall, NTID @ RIT,* https://www.hbtarchitects.com/project/rosica-hall-ntid-rit/, 2020.

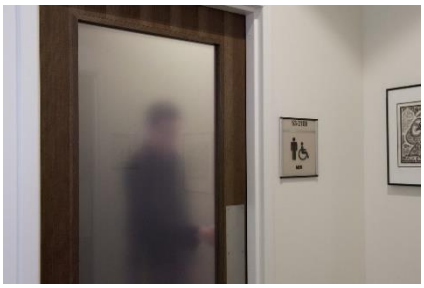

Figure 3.40 – Frosted Transparent Door Outside Restroom – © Mark Benjamin (RIT/NTID)

Figure 3.41 – Research Space [28]

- On the other side of the staircase space, there were public restrooms with frosted doors (Figure 3.40) to allow users to see if there was someone else on the other side of the door, ensuring safety and no accidental door-opening.
- One of the research spaces (Figure 3.41) was a large space that could be separated by portable divider walls. The group inside the dividers could have privacy while still allowing other people seeing that the space was occupied.
- Within the space inside the dividers was C-shaped furniture with a high countertop at a convex to allow more students to watch the screens or teachers while others are sitting in the concave (Figure 3.42). However, it seemed like communication might be an issue.
- Swivel chairs (Figure 3.43) could used by students to turn around and see the other side.

Figure 3.42 – C-shaped Bench and Counter – © Mark Benjamin (RIT/NTID)

Figure 3.43 – Swivel Chairs

[28] HBT Architects, *Rosica Hall, NTID @ RIT,* https://www.hbtarchitects.com/project/rosica-hall-ntid-rit/, 2020.

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	Vibration Range High Vibration = 1 2 3 4 5 = Low or No Vibration	4
	Visual Range Short Range = 1 2 3 4 5 = Long Visual Range	5
Mobility	**Corridor Width** Narrow = 1 2 3 4 5 = Wide	5
	Glass Corner None = 1 2 3 4 5 = Good Use	1
	Curved Corner / Soft Intersection None = 1 2 3 4 5 = Good Use	5
	Visual Cues / Floor Material / Wayfinding No Cues = 1 2 3 4 5 = Good Number of Visual Cues	5
	Walkability Bad Design = 1 2 3 4 5 = Good Design and Various Materials	5
Light and Color	**No Glare from Windows / Background** Too Much Glare = 1 2 3 4 5 = No Glare	4
	Bright and Loud Colors Not Allowed Too Bright and Loud Colors = 1 2 3 4 5 = Neutral Colors	4
	Diffuse and Soft Lighting Too Direct Lighting = 1 2 3 4 5 = Soft Lighting	5
	Soft Reflection Direct Reflection = 1 2 3 4 5 = Soft Reflection	5
Acoustics	**Noise Level from Outside** Noisy = 1 2 3 4 5 = Quiet, No Noise	5
	Vibration from Outside Vibration = 1 2 3 4 5 = No Vibration	5
	TOTAL:	**75**

Table 3.4 – Case Study Data Metrics on Rosica Hall Building

3.5 Table Summary

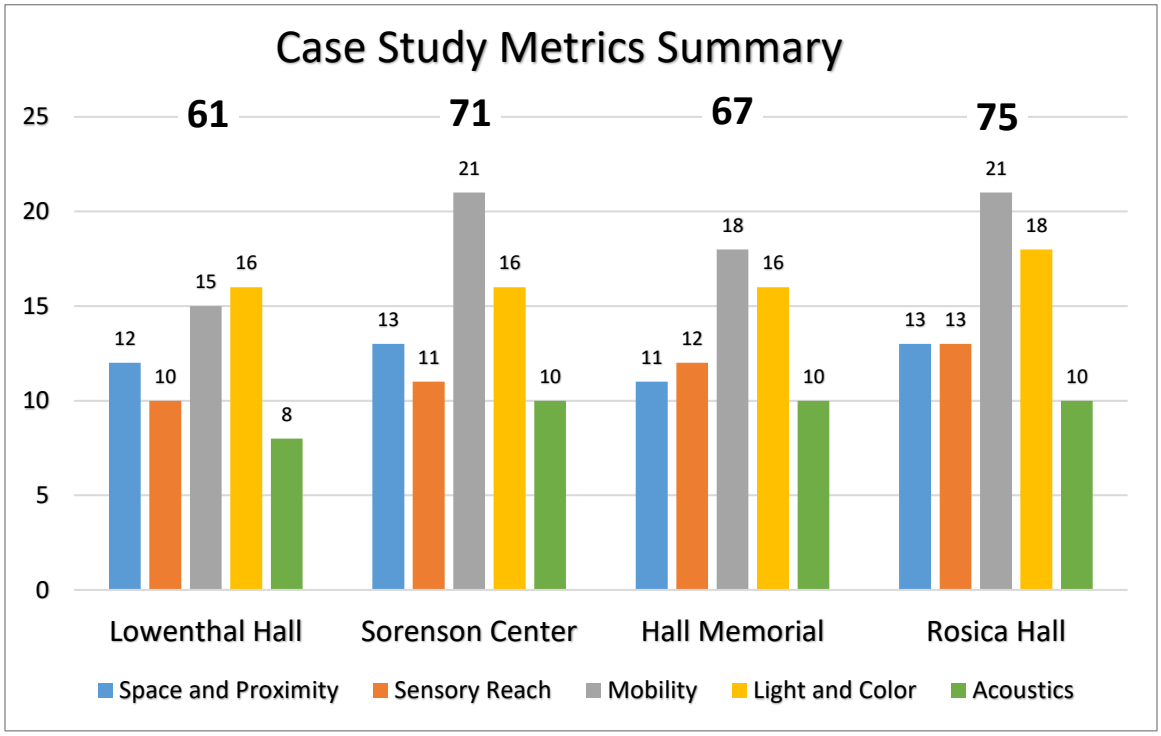

Table 3.5 – Case Study Metrics Summary for All Buildings

In comparing the case studies, it seems that the Sensory Reach guideline is the least used of all guidelines, aside from Acoustics. Sensory Reach is something most academic buildings need. While Lowenthal Hall has some DeafSpace aspects, it was designed without DeafSpace principles incorporated, while the other three case studies were designed with DeafSpace guidelines as shown in Table 3.5. Hall Memorial and Rosica Hall scored the highest because they had the most recent improvements and designs with more DeafSpace resources. In theory, the proposed design for the LBJ facility would have the highest DeafSpace metrics.

Chapter 4

Pre-Design Analysis

4.1 Building Type and Site Analysis

Lyndon Baines Johnson Hall (LBJ) is located within the Rochester Institute of Technology (RIT) campus in Henrietta (a suburb of Rochester), New York. LBJ is the home of National Technical Institute of Technology (NTID), one of the colleges at RIT. It is mainly an academic building which houses classrooms, labs, offices, large theater, and an art gallery.

The LBJ on the RIT campus building is a hub for Deaf and hard of hearing students, so in the proposed design, it must be portrayed as a student-centric space. While the building should be focused on academic use, there also should be a community space where students can gather to study before, between, or after classes. It also should be a space where students and instructors can meet for appointments. LBJ

already has “LBJ Street,” an open center lobby between the main front entrance and the rear entrance, used for such purposes, but is not the most ideal location.

Although LBJ wasn’t designed with DeafSpace principles in mind, it was designed with Deaf and hard of hearing students as the target consumers. The original architects added curved walls outside the classrooms and created an opening above the lobby with a large staircase to the second floor. The main goal now is to improve the building to accompany ever-changing Deaf and hard of hearing education, the growing number of Deaf and hard of hearing students, and especially instructors, because they amount to equal usage of the building.

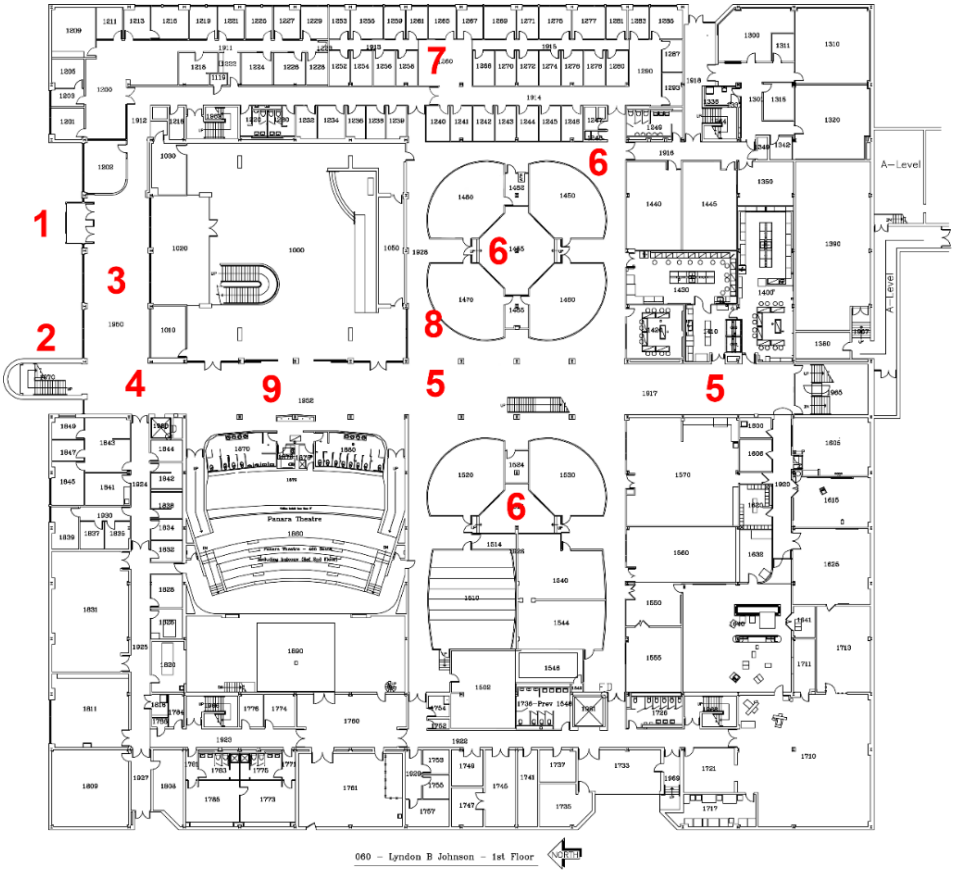

Figure 4.1 – First Floor Plan for LBJ Building [29]

[29] Facilites Management Services, Rochester Insitute of Technology, 2010.

The issues with the current building design (Figure 4.1) that can be resolved using DeafSpace guidelines include:

Figure 4.2 – Front Entrance of LBJ, Negative Space Highlighted

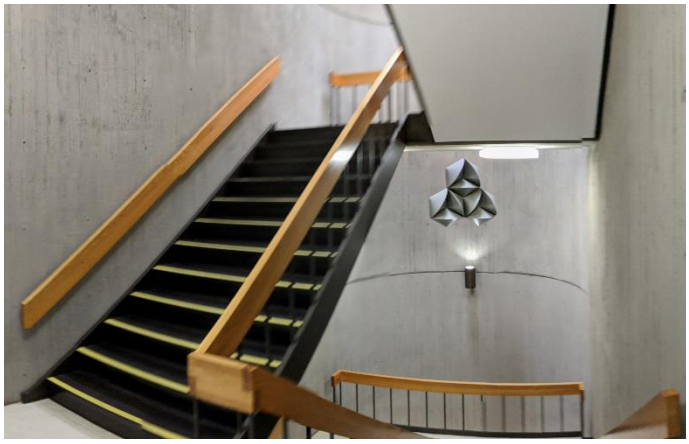

Figure 4.3 – Enclosed Staircase

SPACE AND PROXIMITY

1) Dark and negative space at the front entrance (Figure 4.2). Negative space sometimes is necessary as part of the building entrance but it can cause a dark and unwelcoming environment.
2) The enclosed staircase located next to the front entrance (Figure 4.3) is not very accessible for people who are Deaf and hard of hearing since there is no way for anyone to know if people are using the stairs, and the staircase can cause a lack of visual communication.

Figure 4.4 – Looking Towards Building Entrance

Figure 4.5 – Looking West from Building Entrance

Figure 4.6 – Looking South in Main Hallway

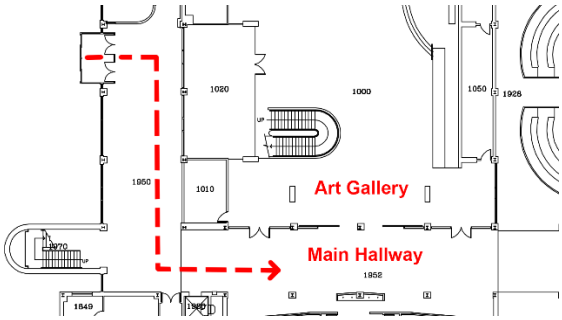

Figure 4.7 – The “S” Curve

SENSORY REACH

3) Upon entrance to the building, the space is not welcoming and is quite dark (Figures 4.4 and 4.5). Entering the building should be bright and welcoming, leading into a large lobby. The first room upon entering the building should act as a hub. That is not the case with the current design.
4) There are sharp “S” turns beyond the front entrance (Figures 4.4, 4.5, and 4.6) Entering the building, people are forced to take a left to offices, and a right to walk towards the main hallway (Figure 4.7).

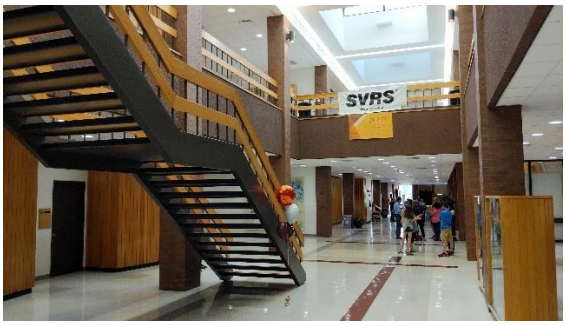

Figure 4.8 – Looking North in LBJ Lobby

Figure 4.9 – Looking Down South in LBJ Lobby

5) There are no community spaces and a lack of furniture (Figures 4.8 and 4.9). While the building has an open lobby, there is a lack of furniture for students to use. It used to have sofas and chairs, but due to complaints, they were moved to other buildings to prevent students from using the lobby space for meeting and lounging, defeating the purpose of community space.

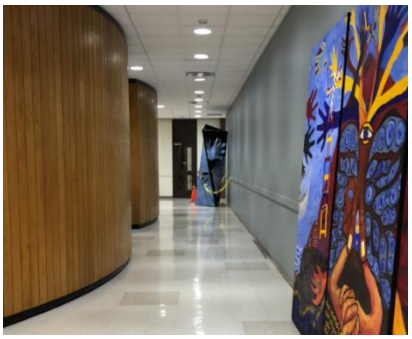

Figure 4.10 – Dead Space Behind the Classrooms

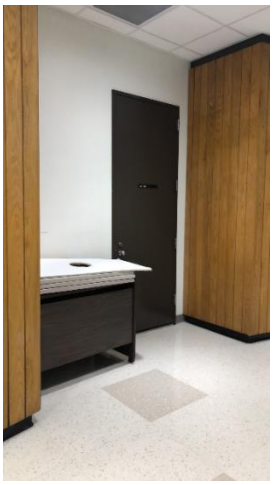

Figure 4.11 – Former ATM Space

MOBILITY

6) Deaf and wasted spaces with no purpose can cause students and teachers to become disoriented within the building. The specific area in Figure 4.10 used to be a private area so students could use an ATM (Figure 4.11). Now that the ATM has been removed, the area is dead and has no purpose except as a shortcut to get to the other side of classrooms. There also is more dead space

in the middle of the four-classroom area. This space was used for equipment for rear-projection in each classroom, but with current technology, this space is not needed anymore and is now a place for storage.

Figure 4.12 – Looking Down the Narrow Hallway

Figure 4.13 – The Wall Outside the Classrooms Facing the Lobby

7) Narrow hallways within office spaces (Figure 4.12) were created when the building was designed to ensure each instructor and staffer had their own offices (most with no windows). The hallways are only four feet wide, which is not conducive for Deaf students and teachers who wish to communicate with each other in the hallway.

LIGHT AND COLOR

8) There are no transparent walls for classrooms (Figure 4.13). Inside the classrooms, only artificial light is used, and there is no way for Deaf and hard of hearing students to know if the room is being used from outside except via the doors on the other side.

9) There is a lack of natural light between the theater entrance and the art gallery entrance (Figure 4.6). The space should be more open and serve as another lobby specifically for the theater and the art gallery.

While there are issues within the building, there are some DeafSpace aspects that were built at the time of inauguration, and others that were added recently:

SPACE AND PROXIMITY

Figure 4.14 – Transparent Fire Door

Figure 4.15 – Curved Furniture Layout in a Classroom

1) Transparent fire-rated doors (Figure 4.14), which are important for Deaf and hard of hearing people in the event of fire; they can see the other side and not slam the doors into other people. Also, people can communicate through closed doors in case of emergencies.
2) Curved furniture layouts in classroom (Figure 4.15), which were redesigned a few years ago. The current layout adheres to DeafSpace guidelines.

SENSORY REACH

3) Transparent walls around the art gallery (Figure 4.16) are important because they give people a chance to see inside without going in, and see if the gallery is open or not.

Figure 4.16 – Transparent Wall and Doors at the Art Gallery

MOBILITY

4) The curved walls outside the classrooms and meeting room near the entrance (Figures 4.13 and 4.17) were built at the time of the LBJ building's opening. This eliminated blind spots created by sharp corners. The curved wall outside the meeting room near the entrance was added recently to encourage students and instructors to use the hallway around the corner instead of focusing on one direction the other way.

Figure 4.17 – Curved Wall Outside a Meeting Room

LIGHT AND COLOR

Figure 4.18 – Skylight Above the Second Floor Hallway

5) Natural light comes from skylights in the main lobby (Figures 4.8 and 4.18). In the center of the LBJ building, there is a row of skylights running north to south, directly above the main lobby and some of the second-floor hallway. This feature addresses the Light and Color guideline.

ACOUSTICS

6) Due to the building's interior wall made of bricks, noises from outside the classrooms and study areas are minimal. There are also no vibrations felt outside the classrooms and study areas due to thick and solid flooring.

DeafSpace Guidelines	Specifications	Case Study Metrics
Space and Proximity	**Personal Space** Low Number = 1 2 3 4 5 = High Number	3
	Furniture Layout – "U-Shaped" Furniture Not Satisfied = 1 2 3 4 5 = Very Satisfied	3
	Visual Sightlines Isolated = 1 2 3 4 5 = Openness and Transparent	3
Sensor Reach	**Open vs. Privacy** Mixed and Fluid = 1 2 3 4 5 = Clear Space for Both	2
	Vibration Range High Vibration = 1 2 3 4 5 = Low or No Vibration	4
	Visual Range Short Range = 1 2 3 4 5 = Long Visual Range	3
Mobility	**Corridor Width** Narrow = 1 2 3 4 5 = Wide	3
	Glass Corner None = 1 2 3 4 5 = Good Use	1
	Curved Corner / Soft Intersection None = 1 2 3 4 5 = Good Use	2
	Visual Cues / Floor Material / Wayfinding No Cues = 1 2 3 4 5 = Good Number of Visual Cues	2
	Walkability Bad Design = 1 2 3 4 5 = Good Design and Various Materials	4
Light and Color	**No Glare from Windows / Background** Too Much Glare = 1 2 3 4 5 = No Glare	5
	Bright and Loud Colors Not Allowed Too Bright and Loud Colors = 1 2 3 4 5 = Neutral Colors	5
	Diffuse and Soft Lighting Too Direct Lighting = 1 2 3 4 5 = Soft Lighting	3
	Soft Reflection Direct Reflection = 1 2 3 4 5 = Soft Reflection	4
Acoustics	**Noise Level from Outside** Noisy = 1 2 3 4 5 = Quiet, No Noise	5
	Vibration from Outside Vibration = 1 2 3 4 5 = No Vibration	5
	TOTAL:	**57**

Table 4.1 – Case Study Data Metrics on Existing Design for Lyndon Baines Johnson Hall

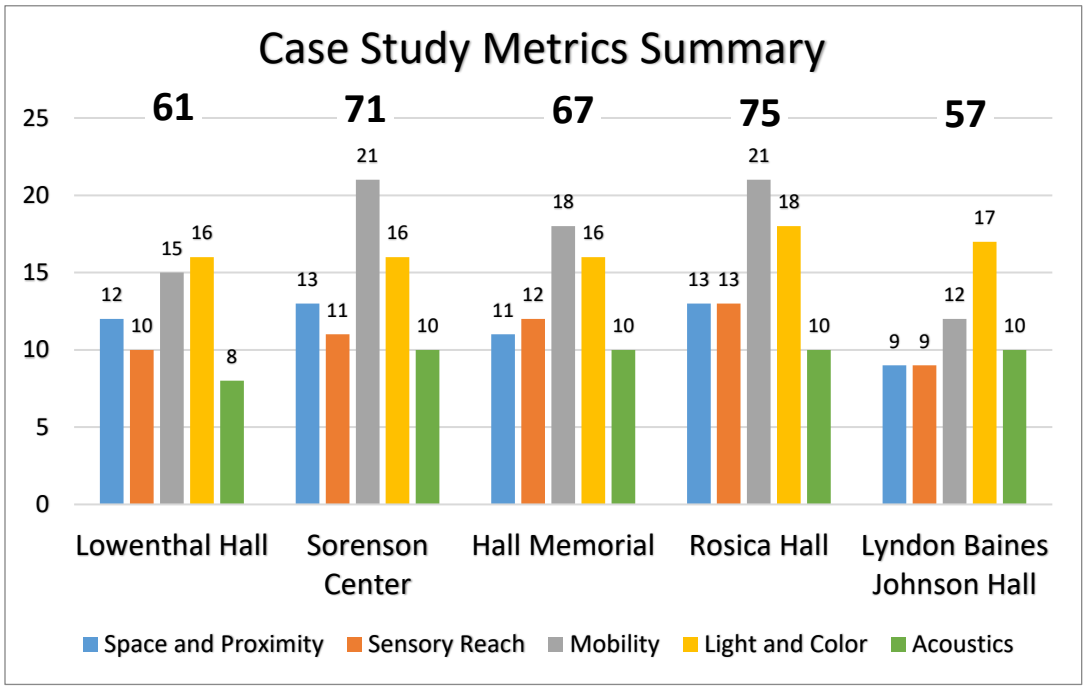

Table 4.2 – Case Study Metrics Summary with Existing LBJ Design Added

According to the metrics, LBJ has the lowest average compared to the other case studies, which means there is room for improvement. One notable aspect is that the Light and Color guideline scores high in the existent design, as the result of cosmetic renovations over the years that involved lighting and painting. The proposed design would mainly focus on Space and Proximity, Sensory Reach, and Mobility.

4.2 Programming

The proposed design contains some renovations and expansions within the existing building. The main design objectives are to improve the building's circulation, to satisfy more DeafSpace guidelines, and to bring in more natural light. The project would also be focused on students and instructors' values in the

community, to develop a better quality of life among the students and instructors, and to encourage sustainability.

For visual accessibility, a major part of DeafSpace principles, students and instructors should have full visual access for one hundred percent of the time.[30] With this new addition, several changes to the existing facilities would incorporate the DeafSpace guidelines, including new colors, larger windows, and social areas. The proposed renovation was planned, designed, and placed in a three-dimensional model using the Autodesk Revit software. The digital three-dimensional model was shown during a presentation to explain how DeafSpace could improve the usage of the existing LBJ building. Additionally, classroom size should be designed for 12-15 students, with between 600 and 850 square footage.[31] Lastly, the corridors and stairs should be wide enough for multiple Deaf or hard of hearing students and staff to carry on with conversations in ASL, while allowing for other people to walk by in the opposite direction.[32]

Another important aspect of DeafSpace is lighting. According to Bauman and Anderson Mason and Dale Architects, Deaf people are more sensitive to visual environment and lighting. Glaring light tires them since they have to use their eyes on a far more frequent basis than hearing people. Therefore, classrooms must

[30] Bauman, Anderson, Mason, and Dale, *Rocky Mountain Deaf School BEST Grant Submittal,* Submittal, Golden, Colorado: Hansel Bauman - Architect + Planner and Anderson Mason Dale Architects, 2011.

[31] Ibid.

[32] Ibid.

have proper lighting to prevent this,[33] which can be measured by direct or undirect sunlight and artificial light, and how they diffuse onto the surrounding environment.

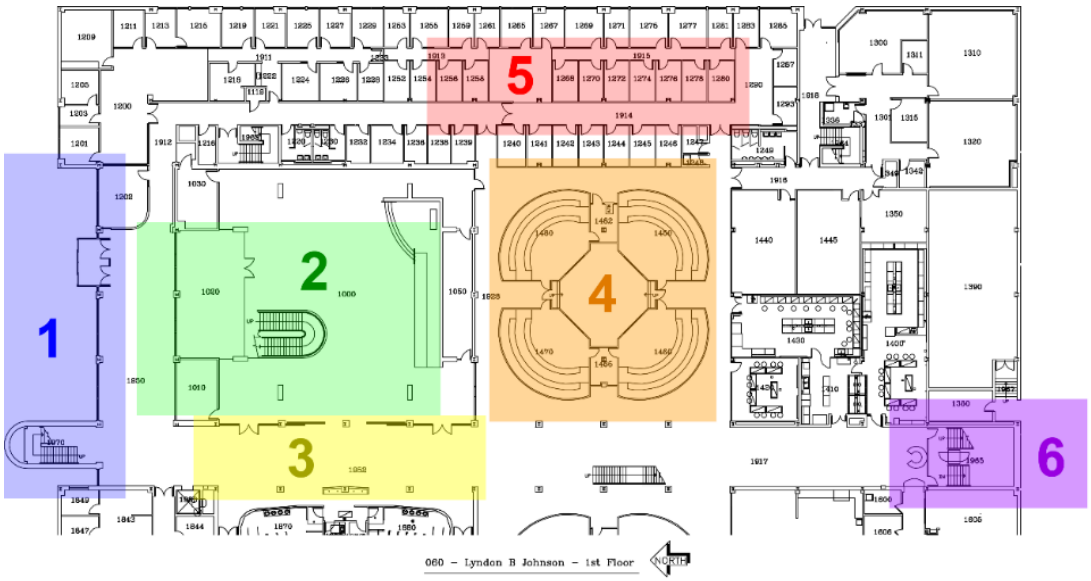

Figure 4.19 – First Floor Plan for LBJ Building (East Half)

The project addressed the following design objectives:

1) New and expanded front north entrance with a new atrium to provide an open space for the community and allow more natural light. This addresses both Space and Proximity and Sensor Reach guidelines.
2) Improved circulation between the north and south entrances, which would eliminate the “S” curve that exists. This addressed the Mobility guideline.
3) More natural light between the entrances of art gallery and the theater would be possible by using the skylight already built above. This addresses the Light and Color guideline.

[33] Bauman, Anderson, Mason, and Dale, *Rocky Mountain Deaf School BEST Grant Submittal,* Submittal, Golden, Colorado: Hansel Bauman - Architect + Planner and Anderson Mason Dale Architects, 2011.

4) Expanded classrooms with transparent walls to create larger classrooms, accommodating more students and allowing flexible furniture layouts. Transparent walls would also allow students to know if the classroom was being used or not. The need for privacy is also important for students. This addresses the Space and Proximity, and Sensor Reach guidelines
5) The addition of more study areas, and wider and open hallways in office areas, would allow for greater mobility. This addresses the Mobility guideline.
6) The addition of a smaller atrium with study areas at the south entrance would contain a large overhang roof to prevent sunlight coming in from the south. This addresses the Space and Proximity and Sensor Reach guidelines.

4.3 Operation

The project could be funded through a combination of federal funds and state funding, donations towards NTID, and RIT funding.

Students would serve as the major focus for this project's operation, along with instructors and the Deaf community. The building would be active during normal working hours, ranging from 6:00 a.m. to 11:00 p.m.. The Deaf community outside of RIT/NTID would be welcomed to socialize, attend art gallery exhibitions, and view shows at the theater.

Chapter 5

Design Solution

5.1 Design Overview

For a DeafSpace design to work, the building's circulation is very important because individuals who are Deaf and hard of hearing heavily depend on their vision. However, such principles also benefit hearing people. Currently, the sightline from the entrance to the lobby is blocked by the art gallery space. Another important aspect of the project is the space between the front entrance (north entrance) and the rear entrance (south entrance) (Figure 5.1).

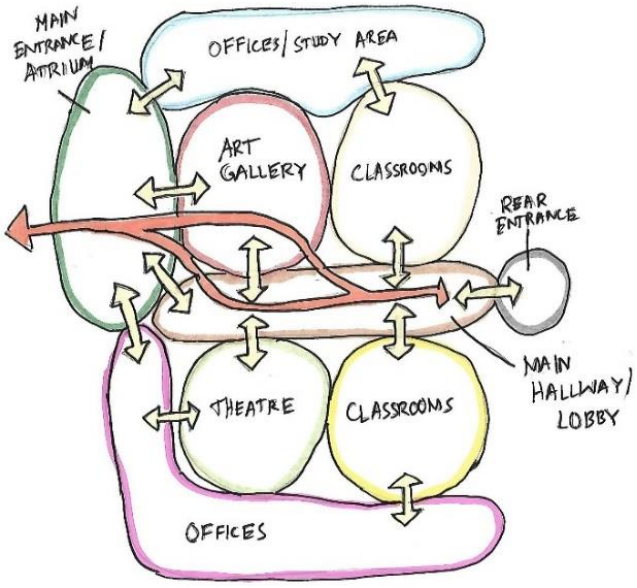

Figure 5.1 – Bubble Diagram for LBJ

To achieve this, an atrium would be added at both the front entrance and the rear entrance. The front (north) atrium would be bigger to create an open community space for students and teachers, and to provide wider and smoother visual sightlines towards the center and the side of the building. The rear atrium (south) would help students find the rear entrance more easily, and provide more study areas by the staircase landing between the second and third floors.

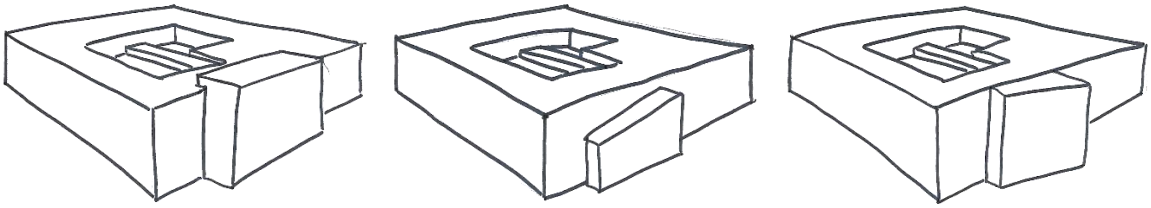

Figure 5.2 – Concept Drawings for Front Atrium

The concept drawings for the atriums were explored through hand drawings (Figure 5.2), then evaluated to see which design would be the most welcoming and strongly contribute to the building's circulation while bringing in more daylight. Rear entrance atrium designs were evaluated with proper shading in mind since it would be located on the south side of the building. The proposed design brings all three concepts together as seen in Figure 5.3.

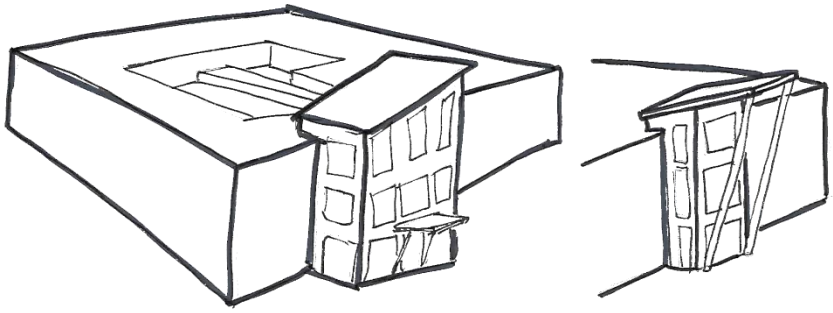

Figure 5.3 – Final Concept Design for Front and Rear Atriums

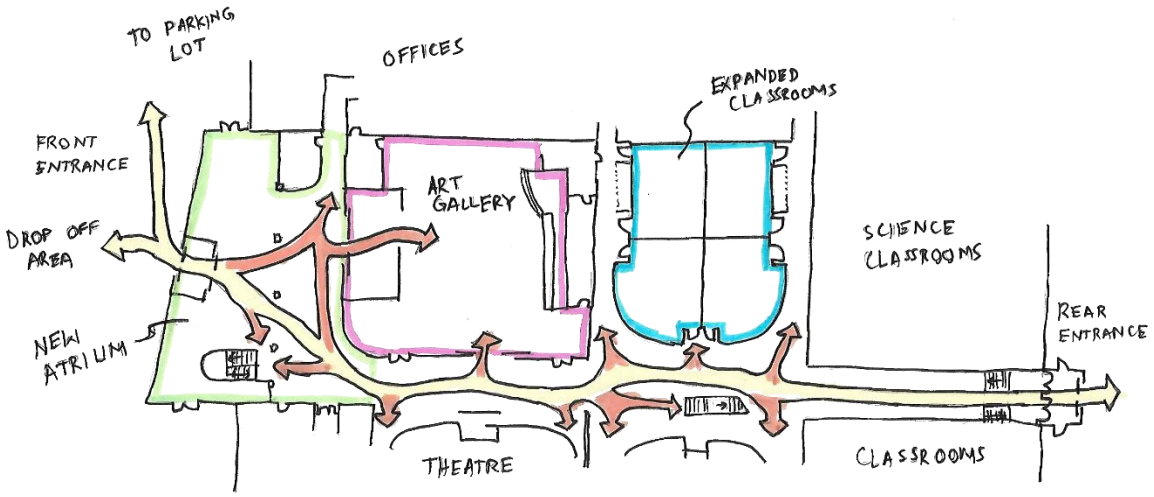

Figure 5.4 – New Visual Sightlines and Circulations (North is to Left of the Drawing)

With the addition of the north atrium (green space in Figure 5.4), the proposed design would open up the space more so people can walk through quicker from the entrance to the lobby to the rear entrance (yellow arrow). The art gallery (pink space) would have a new entrance so it could be accessed directly from the front atrium, rather than from the hallway.

The offices on the east side of the building would be renovated to add more study areas for students and instructors, removing some unused offices. The classrooms (blue space) at the center east of the first floor would be redesigned and expanded to satisfy DeafSpace guidelines. The hallway between the theater and the art gallery would be exposed to natural sunlight via a new skylight .

5.2 New Atriums and Renovated Corridors

SPACE AND PROXIMITY

The proposed additions for the front (north) and the rear (south) entrance atriums would provide a new façade for each side of the building, and should be welcoming and easy to find. The addition would also create a new space for the community to use, such as a study area.

Figure 5.5 – North Atrium Interior

The front entrance atrium, which could be named Deaf Cultural Center, is the largest proposed addition to the existing building. As shown in Figure 5.5, this space uses existing negative space and new three-sided curtained walls on the north, west, and east sides. Above the entrance door of the north atrium is a small cantilever to protect people from rain as they enter the building. The cantilever isn't needed for the existing design because the negative space already provides protection.

The north atrium would serve as a hub and provide numerous visual sightlines once one enters the building. The art gallery's entrance is straight from the building's entrance, the offices and meeting room is on the left, and the theater and classrooms are on the right. The new space also provides a visual sightline towards the second floor, which would be converted from old offices into a sitting and study area. Additional seating area can be found directly above the building entrance.

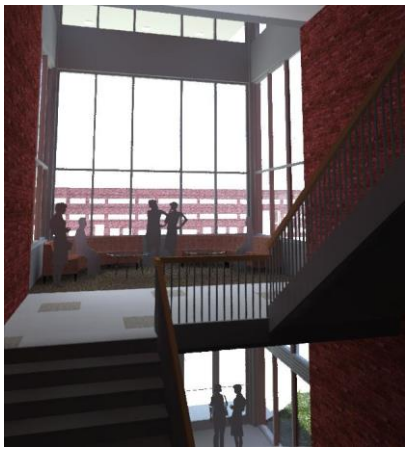

Figure 5.6 – South Atrium Interior

The proposed south atrium has a new study and sitting space at the staircase's landing between the first and second floors, directly above the entrance as seen in Figure 5.6.

SENSORY REACH

The existing staircase on the west side of the north atrium (seen in Figure 5.5) must be sealed due to fire codes and standards. To improve visual range, the brick wall would be partly replaced by a glazing curtain wall, which would be more visually accessible. Also, all railings within the north atrium would become transparent to provide greater visual range.

The south atrium would have three-sided curtained walls to provide an unobstructed view of the campus quad, which would greatly increase visual sightlines.

MOBILITY

Figure 5.7 – Existing North Lobby

Figure 5.8 – Proposed North Lobby

The new north atrium wall is angled towards the east because the majority of students and instructors park their cars in a parking lot east of the building, and also because this would direct interior traffic towards LBJ Street with minimal exterior foot traffic from the west side. Beyond the north atrium, there is a new rounded corner as seen in Figure 5.8. The new rounded corner helps guide the community from the atrium into the main corridor via a soft intersection. Also, for people's convenience, a new staircase is added to the east side of the atrium to gain quicker access to the second floor, improving wayfinding.

The exterior columns from the existing design would be turned into interior columns in the middle of the atrium, with different floor material installed around the columns to give visual cues and prevent any accidents.

Within the south atrium, there would be two different floor materials on the landing, vinyl tiles is used for walking past while using the stairs, and carpeting for the sitting area that would serve as a visual cue indicating different spaces/areas.

LIGHT AND COLOR

Figure 5.9 – Existing North Façade for LBJ

Figure 5.10 – Proposed North Façade for LBJ

Figure 5.11 – Existing South Façade for LBJ

Figure 5.12 – Proposed South Façade for LBJ

The new façades (Figures 5.10 and 5.12) would be surrounded with glazed curtained walls to provide contrast from mostly solid brick exterior walls around the building. Both existing entrances have negative space (Figures 5.9 and 5.11) to provide minimal contrast and little shade for the interior. The new design would

bring in more natural light, and a bit of an orange tone within the glazed curtained walls to represent one of RIT's colors.

The south atrium will be created to provide extra space inside and to bring in more natural sunlight. Since the south side will get maximum sunlight during the afternoon hours, a large overhead cantilever would act as a roof but would also be far enough to provide shade from summer sunlight towards the study/sitting area on the landing between the first and second floors. There is also a second overhead cantilever to protect people from the rain. The curtained wall would have polarized glazing to reduce the amount of sunlight coming through from the south. Sunscreens can be added as a back-up to control the direct sunlight.

Figure 5.13 – Existing Space Between Theatre and Art Gallery, Looking North

Figure 5.14 – Proposed Ceiling Opening Between Theatre and Art Gallery, Looking South

From the north atrium, walking south around the new rounded corner would be the main hallway in the center of the building. This main hallway, nicknamed "LBJ Street," runs from the north entrance to the south entrance. The space between classrooms has an opening above with skylights. The skylights run longer north

than the open space located between classrooms; the north space, between the theater and the art gallery, doesn't have openings to allow sunlight as seen in Figure 5.13. The proposed design would allow an opening to be created but narrow enough to allow the second floor foot traffic. In addition to allowing the sunlight to shine from the second floor to the first floor, students and instructors would be able to know if there are people on the second floor and communicate, and improve their vision range (Figure 5.14).

ACOUSTICS

The new staircase in the east side of the atrium would be free-standing so it would vibrate whenever someone goes up or down, alerting people to the fact that people are using the staircase; this is especially beneficial for DeafBlind people.

5.3 Expanded Classrooms

SPACE AND PROXIMITY

The four classrooms, located just east of the open center lobby, were all identical and arranged in circle-like patterns as seen in Figure 5.15. The proposed design is similar to the proposed layout designed by LaBella Associates in Rochester and Mackey Mitchell Architects in St. Louis. The proposed layout was adjusted to meet DeafSpace guidelines, such as visual sightlines, and to relocate the transparent walls.

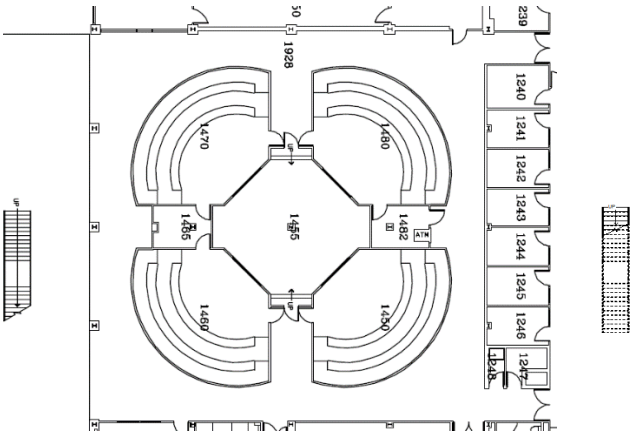

Figure 5.15 – Existing Classroom Layout

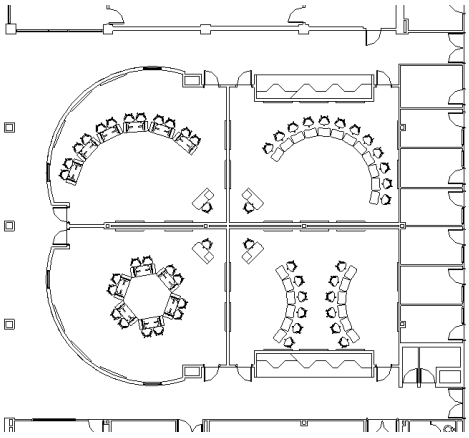

Figure 5.16 – Proposed Classroom Layout

The proposed design shown in Figure 5.16 eliminates the dead space in the center of existing classrooms and between the classrooms and offices on the east side. This elimination allows the classrooms to be larger with more workspace. Outside the classrooms, on the both north and south sides, are laptop bars (Figure 5.17) where students can wait and work before, between, and after classes.

Figure 5.17 – North Laptop Bar

Figure 5.18 – Approaching Classrooms from the Center Lobby

Figure 5.19 – Northwest Classroom

Figure 5.20 – Southwest Classroom

Figure 5.21 – Southeast Classroom

All classrooms are designed to be flexible and provide different uses. The desks and chairs are movable so different furniture layouts can be created, such as semi-circles (Figure 5.19), full circles (Figure 5.20), and grouped (Figure 5.21), with pivoting chairs. To allow flexible use, along with furniture layout, there are small monitors placed on all sides of the classroom.

SENSORY REACH

All the classrooms would have a second set of entrance doors due to their large capacity, so in addition to doors on the sides, front doors would be added, semi-transparent with frosted glazing. Two large frosted windows (Figure 5.18) would be added to the existing wall to provide visual sightlines to allow students and instructors know whenever the classroom is occupied.

MOBILITY

Laptop bars will have carpeted floor to give visual cues that it is a separate space, not a part of the hallway. The counter will be shaped so Deaf and hard of hearing students can choose to face the wall or on the side so they can see people walking by. There will also be a section that is lowered to accommodate wheelchair users.

LIGHT AND COLOR

The wall colors will be neutral such as ivory white and grayish-blue to ensure clear visual lines without vibrant or busy backgrounds. The doors will be semi-transparent with frosted glazing.

5.4 New Office Study Space

SPACE AND PROXIMITY

The proposed new design located on the east side of the building (Figure 5.23) is a new office and study space. Currently, it has all offices along a narrow hallway (Figure 5.22) that is only three and a half feet wide (Figure 5.24), which is the minimum requirement for fire egress. To accompany the new study space, eleven offices will be removed since they are mostly unused by adjunct lecturers, and the double doors will be moved up north to allow more open space.

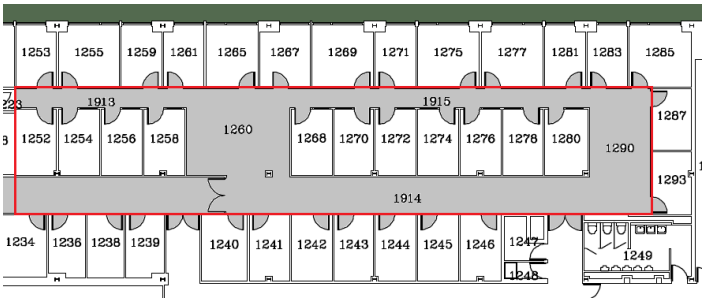

Figure 5.22 – Existing Floor Plan for Office Space – Red Area is Area of Work

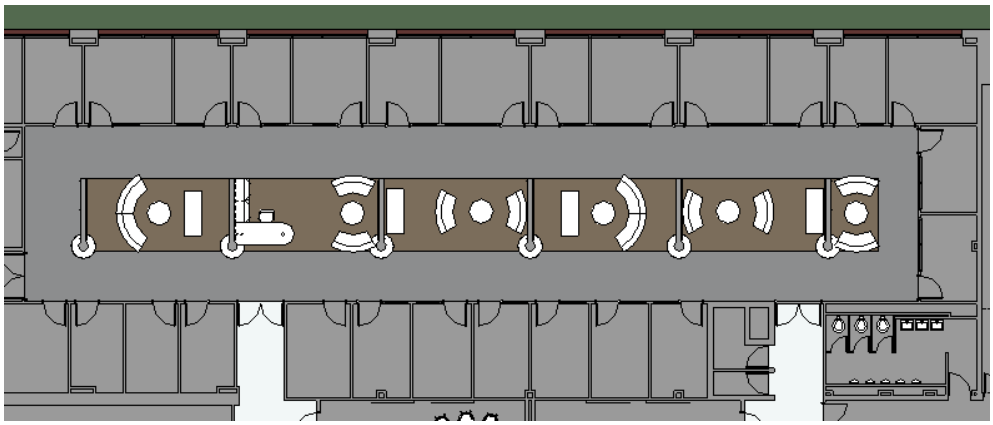

Figure 5.23 – Proposed Floor Plan for Study Space

Figure 5.24 – Existing Office Hallway

Figure 5.25 – Proposed Office Aisle

The proposed design for the new office study space has no hallway but rather an open space with short walls to segment into study spaces. The new space can be divided into two sections, aisles and study areas. Lastly, the furniture will be curved to allow students and instructors to look at each other without turning their heads too much.

SENSORY REACH

All office doors will be replaced with large semi-transparent doors for visual access.

MOBILITY

Visual cues can be provided through different floor materials as seen in Figure 5.25; the aisle floor is made of vinyl tile material, while the study area floor is carpeted. Figure 5.26 shows a wider view of the space, which shows white floor material around the structural column to indicate that there is a column. The columns are actually existing structural columns, and the new design takes advantage of them to mark the walls to divide the study space into five smaller study areas.

LIGHT AND COLOR

The walls would be green and blue back-to-back to provide some contrast between the walls (Figure 5.26).

Figure 5.26 – Proposed Office Study Area

5.5 Building Design Summary and Benefits

DeafSpace can have a lot of impact upon people within the buildings, such as visual sightlines, visual cues, mobility, and especially sustainability. While the proposed design does not solve every problem, it still can provide a much better environment within an existing building. Additional benefits include a sloped roof on top of both atriums to prevent water and snow build-up. Solar panels can be installed on the new roof in the future given its slope toward the south. There is potential for a green wall located on the interior wall outside of the existing staircase.

DeafSpace Guidelines	Specifications	Case Study Metrics
Space and Proximity	**Personal Space** Low Number = 1 2 3 4 5 = High Number	5
	Furniture Layout – "U-Shaped" Furniture Not Satisfied = 1 2 3 4 5 = Very Satisfied	5
	Visual Sightlines Isolated = 1 2 3 4 5 = Openness and Transparent	5
Sensor Reach	**Open vs. Privacy** Mixed and Fluid = 1 2 3 4 5 = Clear Space for Both	4
	Vibration Range High Vibration = 1 2 3 4 5 = Low or No Vibration	4
	Visual Range Short Range = 1 2 3 4 5 = Long Visual Range	5
Mobility	**Corridor Width** Narrow = 1 2 3 4 5 = Wide	5
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	Visual Cues / Floor Material / Wayfinding No Cues = 1 2 3 4 5 = Good Number of Visual Cues	5
	Walkability Bad Design = 1 2 3 4 5 = Good Design and Various Materials	5
Light and Color	**No Glare from Windows / Background** Too Much Glare = 1 2 3 4 5 = No Glare	3
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	Diffuse and Soft Lighting Too Direct Lighting = 1 2 3 4 5 = Soft Lighting	5
	Soft Reflection Direct Reflection = 1 2 3 4 5 = Soft Reflection	5
Acoustics	**Noise Level from Outside** Noisy = 1 2 3 4 5 = Quiet, No Noise	5
	Vibration from Outside Vibration = 1 2 3 4 5 = No Vibration	5
	TOTAL:	**77**

Table 5.1 – Case Study Data Metrics on Proposed Design for LBJ Building

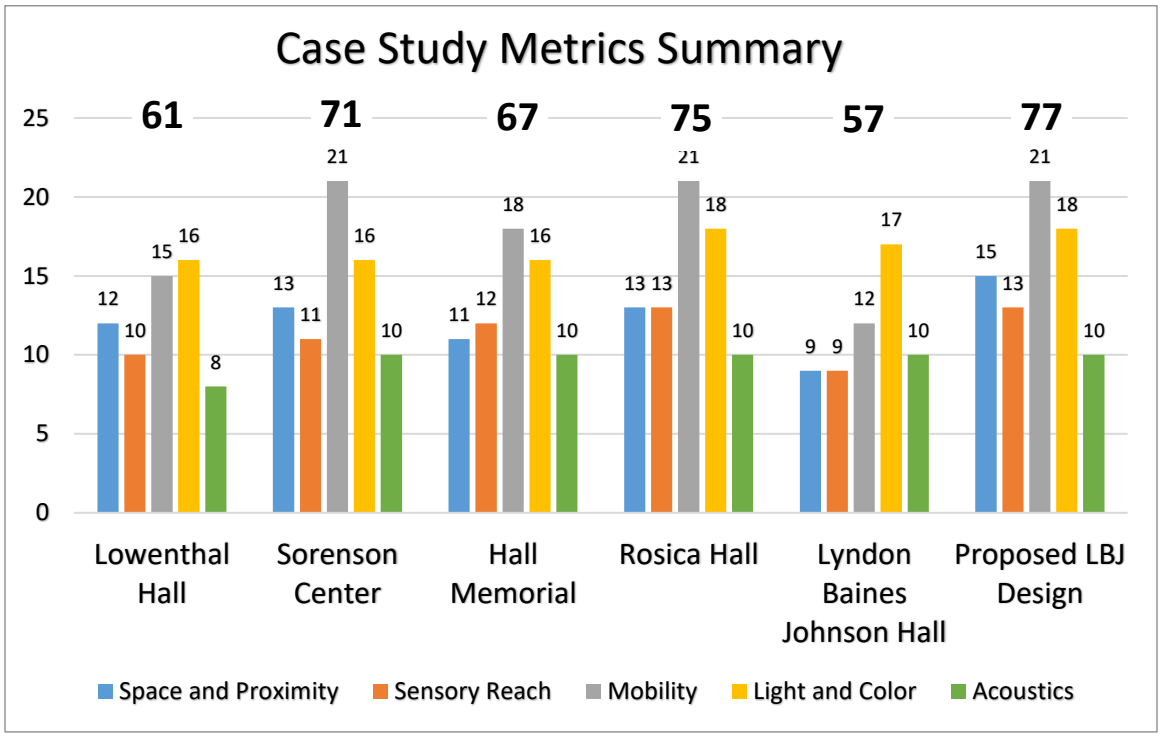

Table 5.2 – Existing and Proposed Case Study Metrics Summary for LBJ

Tables 5.1 and 5.2 show the best scores in comparison with other cases. The new open lobby (Figure 5.29) inside the north atrium provides many visual sightlines and extended visual ranges, and has more curved corners and extra-wide corridors and stairs. There are some spaces aside from high-foot traffic areas for greater privacy. The only major downside is that the large atrium's curtained wall could cause some glare from daylight, but as a tradeoff, it brings in more natural daylight and reduces the use of artificial lighting.

Figure 5.27 – Proposed North Atrium

Chapter 6

Conclusion

The environment that the original LBJ building has does provide some space for Deaf and hard of hearing students to thrive in, even without DeafSpace principles in place. With DeafSpace guidelines applied, the spaces can change in design and greatly improve the environment. The most important aspect for the proposed design is to bring students and instructors closer together, work together more, and circulate the building in harmony.

The proposed design, in theory, also would improve public usage, allowing people to physically detect what's ahead of them and making it easier to find the art gallery and the theater from the main entrance. The increased number of curved walls would help guide the students, instructors, and the public through the building. There would be spaces marked by visual cues, where people can could move away from foot traffic throughout the building. The classrooms would be expanded

to accommodate an enlarged view of the room, and to increase flexibility of the classrooms. The office space mostly unused, would be transformed into a space where students and teachers can come together, yet stay out of public view.

The proposed project lays the groundwork for future projects at RIT, which has 1,130 Deaf and hard of hearing students. However, both new and existing buildings everywhere face similar challenges. By using DeafSpace guidelines, as demonstrated in this thesis, the environment for Deaf and hearing alike can be greatly enhanced.

Figure 6.1 – Proposed South Atrium Exterior

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